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The Buckeye Automatic Cut-off Engine.

ITS EFFICIENCY AND DURABILITY AT HIGH SPEED, AND ITS FITNESS FOR DRIVING DYNAMOS—WHY IT IS COMMENDED FOR USE WITH ELECTRIC-LIGHTING PLANTS.

We take great pleasure in commending, to those who may need them, any engine which possesses the qualities necessary to develop satisfactory results in driving electrical generators, and in our illustration herewith today, we think will be found an engine which satisfies the requirements of modern scientific construction. It is especially designed for durability and efficiency at quick speed, and for high steam pressure.

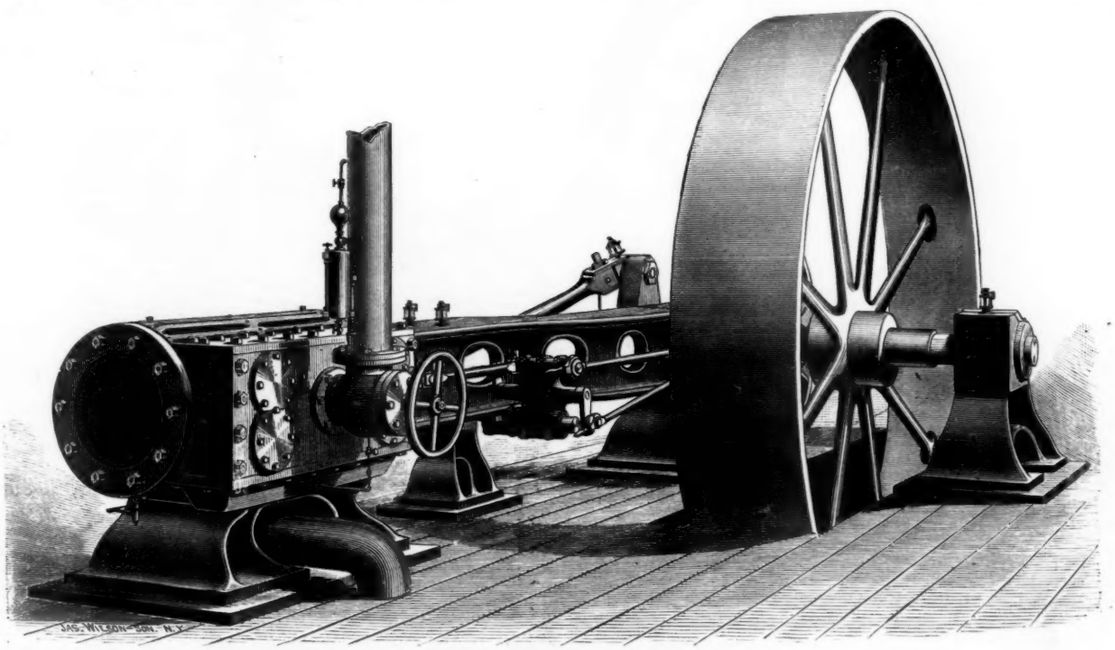

FIG. 1.—BUCKEYE AUTOMATIC ENGINE, BACK VIEW, 18″x36″.

It is provided with a well-tried balanced slide-valve and a sliding cut-off or expansion valve, both having uniform and positive movements. The isochronal regulator, contained in a pulley-shaped case attached to the engine shaft, acts directly on an expansion eccentric, and so closely controls the time of closing the cut-off valve, that steam is supplied exactly in accordance with existing pressure and load.

It has been improved during the past year, and all weak points and other faults developed by the previous eight years' experience in their construction and operation were carefully corrected. As a result of these and previous improvements of like nature, its performance now amply warrants the assurance that it will be found second to no other engine in respect to durability and good running qualities, while, as will appear from the following description, or better, from acquaintance with the engine itself, it possesses many points of excellence peculiarly its own, as may be seen, in quality of material, workmanship, capacity of wearing surfaces, strength, and correct proportions.

We understand perfectly, that while economy, durability, ease of management, &c, are desirable in this service, the same as in any other, the prime, indispensable requisite for this service more than for most any other, is good regulation. In this respect, although the engine was introduced some ten years ago, before the days of electric lighting, it has proved in the near thirty cases in which it has been so applied, to be all that could be desired. Whether it is so in any case or not, depends simply on whether it has been carefully adjusted for the purpose. Given such a reasonably good condition of the general adjustments, such as the packings, strap-joints, alignment of parts one with another, &c., as the engineer may be expected to maintain, its "margin of variation;" that is, the difference between the speeds due to late and early cut-off, depends, other things being equal, on the amount of tension given to the springs *F F* (see Fig.—cut of governor). If that amount were such that if the center of gravity of the weighted levers *A A* could move to the center of motion, which would *be the zero of centrifugal force*, the springs would at the same time come to the end or *zero of their tension*, the regulation would be theoretically *perfectly isochronal;* that is, there would be no margin of variation; the speed would be the same for all points of cut-off within its range of adjustment.

But practically, the limit of tension is a trifle under the amount that would fulfill the above conditions, partly because the friction of the eccentric straps and such other parts as act centripetally must be allowed for by a trifle less tension than if all parts were frictionless, and partly because a trifling margin of variation adds to the stability of the equilibrium between the centrifugal and centripetal forces. But all the margin really necessary for the purpose, when the conditions are reasonably favorable to the normal action of the regulator, is imperceptible by any but careful instrumental tests, while more than is necessary may be present and escape notice altogether, if attention is directed only to the actual performance of the engine in doing its proper work. But, on the other hand, the tension may be diminished till almost any percentage of variation may be produced—ten, twenty, or more per cent.—without impairing the performance in any other respect, though in practice it may be so easily kept within two or three per cent. that there is no reason for allowing more; and, where desired, it may easily be confined within one per cent.

Fig. 1 represents the Buckeye Automatic Engine, back view, 18″x36″, and Fig. 2, the front view of a 14″ stroke.

The engine was the first stationary in the market carrying its governor directly on the shaft and controlling the angular position of a cut-off eccentric, but the plan possessed so many obvious advantages that it has found many imitators.

In order to arrive at a clear understanding of its actual merits, it is necessary to explain, in the first place, that the frictions of the different parts of the governor and the valve-gear it actuates are divisible into two distinct kinds; first, that of the eccentric on the shaft and of the pivots of the bearings or joints of the links which connect the levers with the eccentric produce what may be called "static" friction, because it tends to hold the parts subject to it stationary with respect to the movements required for the exercise of the governor's proper function, the adjustment of the point of cut-off to suit changes of load and pressure.

If there was no other friction about the governor and the parts connected with it, this static friction would certainly, to some extent, produce the effects above described. But the friction of all other parts of the system, the eccentric straps, the joints of the connections of the valve-gear, the rock-shaft bearing, and more particularly the friction of the valve on its seat; all these parts produce what may be called in contradistinction to the "static" friction of the other parts, "dynamic" tendencies, or since the tendency is to pull the weighted levers inwards centripetally, in opposition to their centrifugal force, the latter class of frictions may be called "centripetal friction." The principal part of it, that of the valve, being intermittent, tends to jerk the levers inwards twice every revolution, and but for the static friction above explained, would, no doubt, do so to such an extent as to defeat the proper performance of the governor altogether. But that friction being present in due proportion restrains the centripetal impulses within proper limits, that is, prevents them disturbing the equilibrium perceptibly or objectionably, but not entirely; there is just enough disturbance to keep the static friction in a constant state of being overcome, so that when any change of adjustment is required, these centripetal impulses, alternating, as they necessarily do, with centrifugal reactions, allow it to be ef-

fected as promptly, accurately, and with as high a degree of sensitiveness as if all parts were absolutely frictionless. The valve friction being unavoidable, the static friction is necessary.

We now come to Fig. 3, which shows a horizontal section through the valve and cylinder.

The live steam enters at *A*, Fig. 3, whence it passes through passages *a a''* and the open pistons *D D*, into the interior of the box slide valve *B B*, as shown by the arrows. From the box valve the steam is admitted to the cylinder through ports *b b* in its face, as these ports are alternately brought to coincide with the cylinder ports.

The cut-off valve, which consists of two light plates *C c* connected by rods *C''*, works on seats inside of the main valve, as shown, and alternately covers the ports leading to the cylinder. The cut-off valve stem *g* works through the hollow stem *G* of the main valve. The exhaust takes place at the end of the valve (as shown by arrow on right), into the valve chest and into the exhaust pipe *F* below.

In the valve seats at *e e* are shallow recesses in area to the cylinder ports, which we call "relief chambers." To explain the use of these, it must be understood that, the steam being *inside* of the slide valve instead of *around* it (as with the common slide valve), the tendency of the pressure of the steam in the ports *b b* and in the cylinder, is to force the valve from its seat, but this tendency is counteracted by the pressure of the entering steam; this pressure being proportioned to the area of the pistons or equilibrium rings *Dd*, *Dd*. These pistons are made large enough to hold the valve to its seat at the moment of admission (as at left end of valve, Fig. 3); when the tendency to leave the seat is greatest, being then equal to the pressure of the steam on the united area of both the port *b* in the valve and the port in the cylinder. At other times the pressure on the seat would be greater than necessary; but to prevent such undue pressure, live steam is admitted to the relief chambers *e e* through small holes *f f* in the face of the valve just after it is exhausted from the cylinder, as shown at the right-hand end of valve, Fig. 3, and in turn exhausted from them, as shown at the left, just after the closure of the exhaust. The result is a moderate and very nearly a uniform pressure on the seats at all points of travel, and the arrangement also greatly assists in the proper distribution of lubrication.

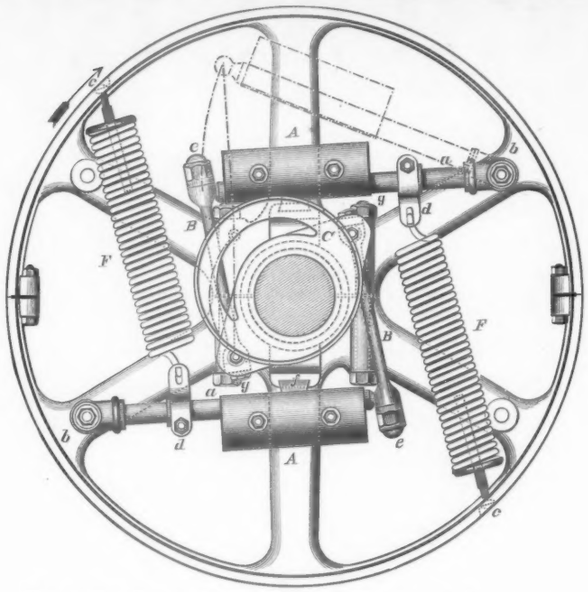

FIG. 4.—THE BUCKEYE ENGINE COMPANY'S ISOCHRONAL REGULATOR.

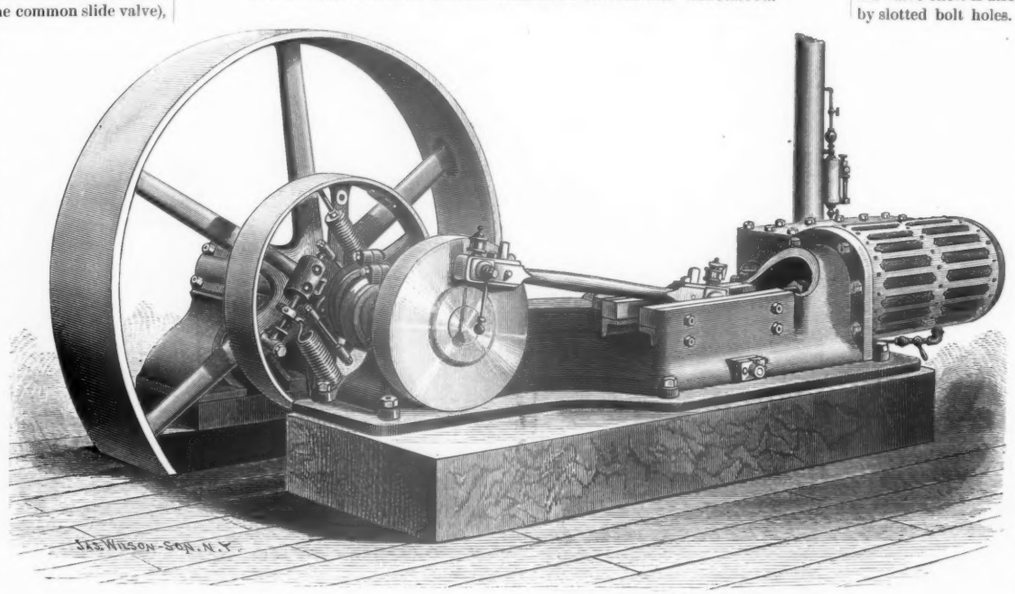

FIG. 2.—BUCKEYE AUTOMATIC ENGINE, FRONT VIEW OF 14" STROKE.

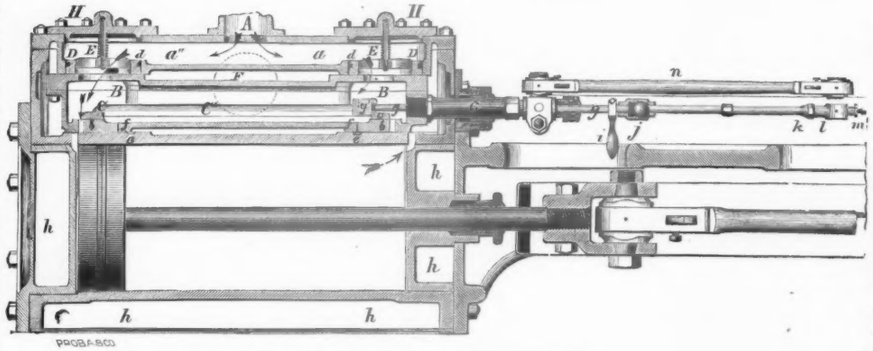

FIG. 3.—SECTION OF CYLINDER AND VALVES.

THE GOVERNOR.

The simplicity of this device will be apparent on inspection of Fig. 4. Two levers *a a* are pivoted to the arms of the containing case at one of their ends, as at *b*, while the movable ends are connected by links *B B* to ears or flanges on the sleeve of the loose eccentric *C*, so that their outward movement in obedience to centrifugal force (as indicated by dotted lines), advances the eccentric forward in the direction of revolution. Springs *F F* of tempered steel wire furnish the centripetal force. The tension of the springs is adjustable by a screw from the outside of the case at *c*, as shown. The proper amount of tension in any given case is that which will confine the percentage of variation due to changes of load and pressure within as narrow limits as may be desirable—the greater the tension the less the variation—so that if desirable it may be reduced until it is imperceptible. In fact, it is possible to obtain close regulation with it as the nature of the load and other conditions outside of the construction of the engine would permit with any known method of regulation.

The proper speed is obtained by adding more or less weight at *A*, or within certain limits by shifting the weights along the levers. As a rule the tension is not to be changed to effect changes of speed, though slight changes of speed may properly enough be so effected, provided no objectionable degree of change of sensitiveness results.

The case is in halves, and is clamped to the shaft by the pinch bolts *g*. Wood buffers at *e* and *f* arrest the levers in their extreme positions. Both ends of the links *B B* are ball and socket joints, to prevent binding.

The spring clips *d* are adjustable along the levers, but once set should not be disturbed. Their position is about one-third of the length of the lever *a* from the pin *b*.

THE RANGE OF ADJUSTMENT.

When the *earliest* cut-off that the action of the regulator can produce is no earlier than is necessary to restrain the engine under its lightest load and greatest steam pressure, the *latest* will be at five-eighths to three-fourths of the stroke, or where it very nearly meets the fixed cut-off of the main valve, due to its lap and angular advance, *and this whole range of adjustment is under complete control of the governor.*

Fig. 5 is a cross section of the bed and compound rock arm. *a* is the rock shaft, vibrating in the adjustable bearings *b b*. The main rock arm *A* is clamped to this shaft by the bolts *c c*, and transmits the motion from the eccentric rod to the valve stem. Through the middle of the arm *A* is a long bearing, carrying the cut-off rock shaft *B* with its arms *C* and *D*. This shaft is actuated from the cut-off eccentric rod on the pin *E*. It will be seen that the cut-off valve thus derives a motion compounded from the movements of both eccentrics. The result is that the cut-off valve has a *constant length of travel* on and relative to the main valve, no matter what may be the relative position of their eccentrics. The pins *E* and *F*, as also the entire rock arm *A*, are adjustable lengthwise. The stuffing box shown at the end of the valve chest is also adjustable in and out by slotted bolt holes. Perfect alignment of all parts can therefore be maintained. The starting bar is used in the hole H.

The wearing surfaces of eccentric *A* and straps *B*, Fig. 6 are spherical in form; that is, they are a central section of a perfect sphere or globe of a size always corresponding to the exact diameter of the eccentric; consequently the operation is precisely that of a ball joint, and is independent of perfect alignment of connecting rods.

Curved surfaces have sometimes been used for eccentrics and straps, but they have been mere curves without reference to spherical form, hence they cannot properly provide for inaccurate alignments of connections. The benefits of this improvement over the old form, in the way of easy, cool, and quiet running, is very noticeable, much more so in fact than was expected beforehand. Of course we have had to construct a special tool to do the work.

It is frequently necessary to make slight adjustments of the fixed eccentric on the shaft to correct lead or compression. Wedge *a* and toothed block *b* bind the eccentric to shaft *S*. By slacking nut *c* with a common open-end wrench, the adjustment to any degree, and the retightening can be effected in a moment's time, and the eccentric is thus held firmly to the shaft without key or set screw.

Fig. 7 is the drop hook. A solid hook soon wears loose, and rattles, and is liable to be thrown out by a dry eccentric. We therefore make a gun-metal spool *b* in halves, and closed to an easy fit on the pin *a* by the bolt *c*. The handle *d* is continued in a threaded spindle, which, by a half turn, bites into a counter-sink in the spool *b*, taking up all lost motion and holding the hook securely in place. The heavy side of the spool keeps it always hanging in the proper position to receive the hook in starting.

The waste cocks, Fig. 8, are automatic, relieving any water, and closing by a spring. Both cocks are linked together from the pins *b*, and operated by a single lever near the throttle valve.

Motion is delivered to the main valve stem through the pinch wrist, Fig. 9. This is split and clamped to the stem *b* by the bolt *a*. Its grip is sufficient to drive the valve, while it will yield to any undue resistance.

To insure the necessary flexibility in the governor, its links (*B. B.* Fig. 4) are provided with ball and socket joints.

A similar joint in the cut-off valve stem is shown by Fig. 15. The sleeve nut *b* screws over the head of the stem *d*, and is jammed by a similar sleeve nut *c*. The clamp handle *e* is set at an angle of about 45°, and its weight keeps the lost motion out of the thread in the other end of the stem not shown.

Fig. 11 is an excellent device for oiling the crank pin from a can, while running. It is intended to be supplementary to an oil cup on the rod. A hole is drilled lengthwise of the crank pin, and a smaller one radially outwards on to the bearing at *c;* both are shown in dotted line. A tube *b* communicates with this passage, and terminates in a ball having a hole at *a*, exactly in the center line of the shaft. This tube being fast to the crank, and moving with it, it follows that the ball *a* is stationary in position, merely turning on itself. An oil can may be inserted into *a* while the engine is running, and the centrifugal force will throw the oil through the tube on to the bearing. This device has saved many a stoppage, when the oil cup has happened to choke up, or feed out.

Like a number of other engines with which our readers are familiar, this seems to be well adapted for use in connection with electric lighting plants, as we have pointed out; and we should judge, from the fact that the Buckeye Company has selected Mr. Geo. A. Barnard, the well-known mechanical engineer, to represent them in the East, that they expect to get a share of the business in the electrical field.

One of the best-paying electric lighting companies in the East is at Lowell, Mass. A quarterly dividend of 0.2 per cent. has been recently declared.

The Radiation of Incandescence Lamps.

Engineering says that Captain Abney, R.E., and Lieut.-Colonel Festing, R.E., have been studying the relation between the radiation, energy, and temperature of the carbon filaments in incandescence lamps. A Grove's battery was employed to give the current, which was measured by a tangent galvanometer or a Thomson current meter in circuit, while the difference of potentials between the poles of the lamp was measured by a Thomson potential galvanometer. The radiation from the lamp was measured by a thermo-pile coated with lamp-black and in circuit with a Thomson galvanometer of .5 ohms resistance. The readings were taken of the first deflection caused by the thermo-electric current and checked by the total deflection, but the former is the more rapid and correct proceeding, as there is no change of zero during the observation. A pair of cardboard screens with narrow slits were placed between the lamps and thermo-pile, so as to allow the light from a section of the filament to strike the pile, while keeping back the radiation from the glass as much as possible. The lamps were also heated in an oven to 350 deg. C., and their change of resistance by temperature measured. The results so far with Edison, Maxim, Brush, and Lane-Fox lamps may be summed up as follows. The current can be expressed as a function of the potential; the radiation, after a certain temperature of the filament has been reached, bears a simple proportion to the energy expended in the lamp; the resistance can be formulated as a function of the energy and therefore of the radiation; and the temperature appears to be nearly a simple function of the resistance. The curve described, by using as ordinates and abscissæ the amount of current and potential in the different experiments, have the same general form, which appears from inspection to be that represented by the equation $c = a\ p + b\ p^{\frac{1}{2}}$ where c is the current and p the potential. The first term of the right-hand member seems to represent the amount of current which would pass if the filament could be kept at some particular temperature (probably the absolute zero), and the second the additional current due to increased conductivity caused by increase of temperature. The value of the energy in watts would be $w = p^2\ (a + b\ p^{\frac{1}{2}})$, and the resistance in ohms $\frac{1}{a + b\ p^{\frac{1}{2}}}$. The form of equation between energy and resistance would be rather more complicated, $w = \frac{(1 - a r)^4}{(b\ r)} \times \frac{1}{r}$.

The First Electric Railway in Bavaria.

A short time ago, an electric railway from the Rosenheim Railway Station to the sawmills of Mr. D. Steinbeiss was completed. It is about two-thirds of a mile in length, of the ordinary gauge, and is intended to transport the rough logs from the station to the mills, and the sawn timber back to the station. The locomotive consists of an ordinary platform truck, on which are two dynamo-electric machines, together with an apparatus for reducing and regulating the speed. The power is conveyed to the wheels of the truck by means of toothed gearing. A very simple lever arrangement enables the locomotive to be started, stopped, or reversed, without interfering with the revolutions of the dynamos. On the trial trip, 6 tons were conveyed at the rate of 140 ft. per minute, 4 horse-power only being employed. At night, the engine supplies the electricity to the Edison lamps, which light the works.

The Electro-Magnetophone.

At the Munich Exhibition of Electricity Mr. Weigele exhibited a series of interesting acoustic apparatus. Among these there was one called by the inventor an electro-magnetophone. This instrument, which is shown in the accompanying cut, consists of a tin disk fixed at the bottom of a hollow cone, and having above it an electro-magnet, and beneath it a mercury cup into which dips a metallic point. When the current passes, the electro-magnet attracts the disk and breaks the contact with the mercury, the current ceases to pass, and the contact is set up again, so that the disk is set in motion in the same way as the vibrator of a Ruhmkorff coil. There may be thus obtained from 400 to 440 vibrations per second. The sound that is produced is very intense, and the inventor thinks that it will be possible to obtain in this way sounds loud enough to be employed as fog signals.—*La Lumiere Electrique.*

Storage Battery Light.

A Pullman dining car of the 5.40 express to Leeds has been lit by six Swan incandescent lamps, supplied with electricity from one primary battery of twelve cells, the dimensions of the battery being: Length, 4 feet; breadth, 8 inches; and depth, 8 inches. The battery is of zinc and carbon, with new depolarizing arrangement, the details of which have not been made public. The lamps diffused a bright, warm and perfectly steady light, which was at no moment affected by the oscillation of the carriage, and which made it not only possible, but perfectly easy, to read a newspaper or book printed in small type. The result of other preliminary trials of the system has been that several railway companies, including the Great Eastern, the Southeastern, and the London and Southwestern, have shown a desire to adopt it. The light can be turned on or off at pleasure, and it can, therefore, be used in the day when a train is passing through a tunnel. The inventors of the battery express a belief that they will be able to supply private dwellings with electric light for less than the estimate lately put forward by the Edison Company and the Golcher Company. The battery which was used on Thursday week weighed under 150 lbs., and one capable of supplying eighteen lights for eighteen continuous hours would weigh about three cwt. The inventors of the system are Mr. G. C. V. Holmes and Mr. F. E. Burke.

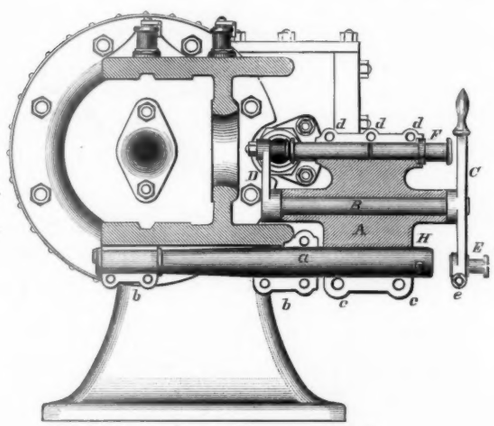

Fig. 5.—Cross Section of Bed, &c.

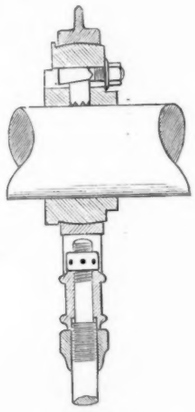

Fig. 6.

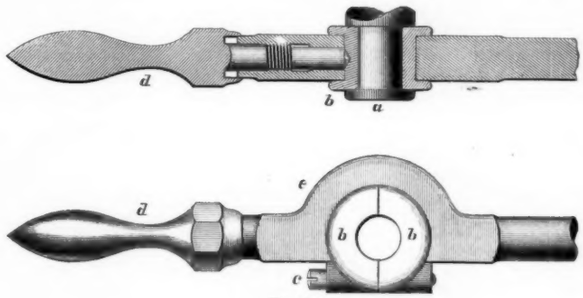

Fig. 7.

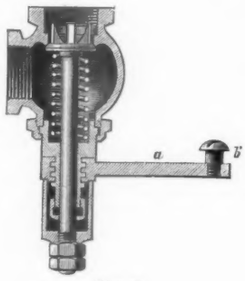

Fig. 8.

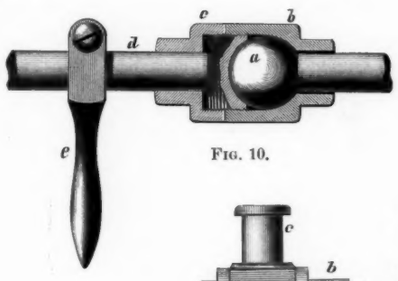

Fig. 10.

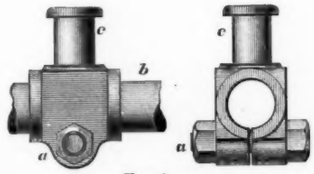

Fig. 9.

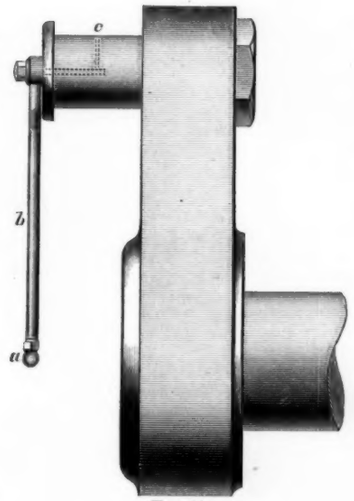

Fig. 11.

The republic of Guatemala has engaged a Ceylon planter to introduce in that country 500,000 cinchona trees, for obtaining Peruvian bark, from which is distilled the salts known as quinine.

At present the number of iron-producing establishments in Russia is 141, with 205 blast furnaces, producing yearly 450,000 tons of pig iron

ELECTRIC LIGHT WIRES.

Is it Impracticable to Put Them Under Ground?

HENRY MORTON SAYS THE QUESTION CAN ONLY BE SOLVED BY A SYSTEM OF SUB-WAYS UNDER THE STREETS.

The following valuable letter, which appeared in the *Times* of Sunday last, will be, we think, of exceeding interest to our readers:

To the Editor of the New York Times:

In considering what should be done or left undone in reference to the running of wires to supply electric lights in the streets of New York, several questions present themselves as requiring answers before a judicious conclusion can be arrived at. What is the present extent of the business involved? What dangers or inconveniences do actually exist, or have been proved to exist, in the present systems during the two or three years of their past use? What remedies have been suggested, and what effect would the application of these remedies have upon the continuance and extension of these users of electricity? What light does experience in Paris London, and elsewhere throw on this subject? What possible dangers or inconveniences have been suggested as likely to be encountered, though not yet experienced, and what probability is there that these anticipated dangers will ever be realized?

In the first place, let us consider what is the present extent of the use of electricity conducted through the streets in the city of New York. In the first place, we should observe that there are three general systems of distribution now in use:

First—The underground low tension system of Edison, used exclusively for incandescent lights, each of which gives a light about equal to that of one gas-burner.

Second—The medium tension aerial system, used by the United States Illuminating Company for incandescent lamps arranged in series.

Third—The high tension aerial system, used by the United States, the Brush, the Fuller, and other companies for arc lights.

First—The Edison underground system comprises a network of conductors whose united length is about 16 miles, and which are distributed over an area comprised between Beekman and Wall Streets and Broadway and the East River. This actually supplies current for about 5,000 incandescent lamps, expressing a total illuminating capacity of about 80,000 candles. The total number of lamps connected is about 10,000 of which the largest number in use at one time has been 5,000.

Second—The medium tension system has as yet reached so small a development that it need not be taken into account in comparison with the others.

Third.—The high tension system comprises between 300 and 400 miles of aerial wires, running all over the city, some single circuits being ten miles in length, and supplies about 1,800 arc lamps of about 500 candle power each, or, in the aggregate, about 900,000 candle power.

It will appear from the above that the third system as to the length of its conductors (say, 350 miles) exceeds both the others about twenty times, and as to the amount of light supplied exceeds them about five times. This being the extent of the various systems, we will next inquire what damage to life or property has actually been occasioned by each and all since their establishment. To any one who has read what has recently appeared in the papers on this subject the correct answer to this question will, I think, be very surprising.

In the first place, the only loss of life certainly due to any of these systems is the killing of one of the employes of the Brush Company while he was engaged in the hazardous operation of splicing a wire in which the most powerful current was running. There is also reported the case of a waiter who fell from the outer railing of the Metropolitan Concert Garden, either in consequence of receiving a shock from an arc lamp or simply by losing his footing. Beyond this there is not a case truly recorded of injury to man or animal by reason of the electric currents in those hundreds of miles of wires.

Two stories have appeared in the papers of horses injured by the currents from wires, but both of these proved on investigation to have been absurdly misstated. Thus, the horse said to have been thrown down on Fifth-avenue by the electric shock on stepping on a wire and killed, was, in fact, tripped up by and entangled in the wire, but received no injury whatever, save that inflicted mechanically by the wire, and is at present alive and well. So also the pair of horses reported to have been thrown down by shocks from a telephone wire which had fallen across the Brush wires on Fourteenth street. They were, in fact, simply entangled in a telephone wire, which was not in connection with any other wire, and was incapable of giving the slightest shock.

So it is with the stories of firemen injured by electric shocks. I am informed by those on whose statements I can rely that there is no official record of any injury to a fireman caused by the current from an electric carrying wire.

In the second place, as to damage to property by fire: It is the duty of the Fire Marshal of New York to ascertain and inquire into the origin of all fires within the city limits. The records of this officer show since May, 1881, ten items referring to fires caused by electric light systems, and the total loss reported from these is $85, of which $75 is due to the Edison underground system, and $10 to the medium tension incandescent system of the United States Company. The first item is dated May 15, 1881, and refers to the burning of the insulation of two arc light wires. No damage. The next two items are of the same character. Then on Oct. 25 comes the burning out of magnets in three fire-alarm boxes and of the relay magnets at Central Office. This result might be caused by atmospheric electricity, and, like that source of danger, can be readily provided against by the use of fusible safety catches. The next item is Oct. 13, 1882. Wood-work ignited by carelessness of a boy in handling an incandescent lamp of the United States Company. Damage, $10. The next item Dec. 10, 1882. No. 174 William street. Damage, $50. Edison Company. The next is June 10, 1883. No. 121 Front street. Damage, $20. Edison Company. The next, Sept. 10, 1883. Nos 165 and 167 Bowery. No damage. New York Electric Light Company. The next, Sept. 23, 1883. No. 88 South street. Damage $5. Edison Company. Lastly, Oct. 3, 1883. Nos. 165 and 167 Bowery. No damage. Wooden ring on lamp ignited. New York Electric Light Company.

From these records, it would appear that as a matter of actual experience the entire damage considered worth reporting was caused by low or medium-tension systems supplying incandescent lamps, and that by far the greater part of this was due to the Edison underground conductors. Moreover, it is worthy of notice that the above ten items are the examples of "fires started by electric wires" given in the *Times* of Nov. 18, on the authority of Fire Marshal George H. Sheldon.

The insignificant amount of the damage, and its distribution among the systems, is remarkable. Both are largely explained by the fact that fire caused by such means, especially with the aerial conductors, is sure to be at once noticed and promptly suppressed. Where the conductors enter buildings underground, defects in insulation are not so conspicuous, and a fire, if started, not so easily discovered. The net result of two and a half years' experience certainly shows that this new agent of illumination is very much safer than any of the old ones it replaces, even under the disadvantages of novelty and first introduction.

Few and slight, however, as the losses and dangers from the introduction of the present system of electric distribution have been, there is no reason why we should not try to make them less, and with this object we will examine the plans which have been proposed for that purpose. The most prominent of these is the substitution of underground for aerial conductors, and for this its advocates claim by implication an avoidance of existing risks. In considering this question, there are certain points deserving attention which seem so far to have escaped the notice of those who have written on this subject.

First—As far as the use of electricity within buildings is concerned, it manifestly can make no difference whether the conductors are above or under ground on their way to the building, except that, as I have indicated before, the underground wires can more easily get out of order and cause fires, or become grounded, and thus involve risk to those touching them, than can the aerial lines. That this is, in fact, so, is proved by experience of the Fire Department, whose records show that more than seven times as great loss has occurred from the sixteen miles of underground wires than from the three hundred odd miles of aerial wires, though the latter have been much longer in use. Manifestly, then, as far as all interior uses are concerned, the underground system is not to be preferred.

As to out-door applications, there is little to choose on the score of safety. If carried from place to place underground, the chance of ground connection would be much increased; and as the conductors must come above ground wherever used, the risks of injury from accidental contact with them would be augmented, so that this disadvantage would, I think, compensate for the small gain which would result from the diminished amount of circuit exposed. Even, therefore, if we assume that there are no practical difficulties in the way of carrying these currents underground, the motive is small, or not in favor of the change on the ground of security. As a question of beauty, I readily grant that all overhead wires of every sort should be suppressed, but let us see if we can afford to sacrifice to the graces all that is required in this connection. Experience is better than theory in any case, and we can, I think, refer to experience with advantage in the present instance.

We all remember how, five years ago, Paris was ablaze with electric lights. To day, I am informed by several friends who have just returned, electric lights are hardly to be found in the streets of that city. From the first the conductors were there all run under ground, and from the first, as was pointed out at the time, the expense was fatal to any commercial success in such lighting. As long as the city was willing to pay from eleven to thirteen times as much for the electric as for the gas lighting it could be done; but when the novelty wore off and matters came to a business basis, the electric lights went out and the gas lamps were relit. Turning, again, to London, where likewise the wires have been put under ground, extremely little has been done in the way of street lighting or electric distribution from central stations. Coming nearer home, we find that in Chicago, in St. Louis, and in Milwaukee, where ordinances have been passed requiring conductors to be laid under ground, no progress has been made in street illumination by electric lighting from central stations. Judging, therefore, from experience and observation alone, it would seem that it is impossible to carry on successful electric lighting on an extensive commercial scale with underground conductors.

Were the wires ordered to go under ground in New York, it is highly probable that our streets would soon return to their pristine gloom, as have those of Paris. To be sure, our enterprising companies might maintain some part of their work by establishing small stations at numberless points, each supplying its immediate neighborhood. But the risk and nuisance involved in this multiplication of small boilers, engines, and machines would far exceed any now existing. To put under ground three hundred odd miles of conductors during a year, to say nothing of alterations and repairs, would about extinguish the remaining patience of New York citizens and render the city quite uninhabitable during the progress of the work. To say that a few wires have been put under ground in Paris, London, and elsewhere, and have been operated efficiently, if not with economy, proves nothing whatever as to the possibility of accomplishing even the same thing in New York, where the enormous extension of the system as regards the length of circuits enhances the difficulties of the problem, while the entire absence of available subways or sewers makes an additional difficulty. In other words, what would be possible, to a limited extent, in Paris or London, would be absolutely impossible on the scale of existing systems, and with the absence of favorable conditions found in New York.

Moreover, it must not be forgotten that the only real motive for using an underground system is the desire to avoid the ugly looks of aerial wires, and this would be little affected by removing the electric-light wires alone, since they form but a small fraction of the entire system, being outnumbered tenfold by the telegraph and telephone lines. The æsthetic requirements can only be met by the removal of all wires, and this is a problem which seems to defy any suggested solution short of a system of subways which would be equivalent to adding a duplicate set of thoroughfares to the principal streets under ground.

If this were done thoroughly and systematically, then all sorts of electric conductors could be placed in such subways with security and assurance of efficient working, and be accompanied by water, gas, and steam pipes, thereby relieving the streets from the endless upheavings now suffered, and which would be multiplied to an intolerable extent if the electric companies were added to the licensed excavators who now hold practical possession of the city's thoroughfares.

Turning next to the suggested dangers, of whose actual existence no evidence is even claimed, that which is most talked about is the risk that firemen would run in directing a stream of water against a wire carrying a current. While there is no evidence as to any such result ever having been observed, we have the best evidence against the probability of its occurrence in two instances, which were related to me by eye-witnesses. During the burning of the Park Theatre, about a year ago, two firemen held the nozzle of a hose, which, for upward of an hour, played against and through a Brush lamp, through which there was all the time passing the full current of a 40-light machine. The jet of water smashed the globe, knocked out the carbons, and then deluged the lamp (the current passing through it by its automatic switch) and thus came in full contact with uninsulated parts of the circuit, but not even a shock was perceived by the firemen. Without doubt, theoretically, some infinitesimal part of the current may have passed through them, but an infinitesimal amount of electric current is as harmless and inappreciable as the infinitesimal quantities of poisons which we swallow every day in the purest foods.

In order that an electric discharge should kill, it is not enough that it should have sufficient electro-motive force to overcome the resistance of the human body. It must also possess considerable quantity. Hundreds of people, myself among the number, have taken the discharge of induction coils where the electro-motive force was many hundred times that of a 40-light Brush machine, without any ill effect. Lightning, as its heating effects show, has not only a high electro-motive force, but also a quantity vastly greater than that of any electric arc light current ever met with in ordinary use; and any indefinite or ambiguous statement to the contrary, even by high authority, must simply be regarded as misunderstood or erroneous, and those who have been killed by lightning have certainly not yielded to any insignificant quantity of the discharge. Should such a combination of conditions occur as would cause a large part of a powerful electric current to pass into the body of a fireman holding a hose it would, of course, kill him; but the fulfilling of such conditions is as improbable as would be those which

would cause him to be struck by lightning, which also might follow down a stream of water.

In this connection it must not be forgotten that whenever a wire breaks the current in it is by that act annihilated, and that this is at once known at the central station by the extinction of the pilot-light, which is the signal for the immediate stoppage of the machine, so that the idea of currents in broken wires is purely a figment of the imagination as far as arc light circuits are concerned. In the low-tension underground system, however, conductors are so connected that a single rupture on a distributing branch of a circuit does not destroy or cut off the supply, which is simply diverted to another channel.

If it is considered that the interests of the citizens of New York can be served by the abolition of all electric lights using overhead wires for the sake of the architectural beauties they now deface, such a result is no doubt attainable; but it must not be forgotten that this means the loss of almost all public lights, as these, whether on lamp-posts or in or opposite store windows, are as a rule supplied from central stations, and also that this remedy leaves the æsthetic problem where it now stands in reference to the equally offensive telegraph and telephone wires. The one practical and efficient final remedy is an inclusive subway system for all kinds of conductors—steam, water, gas, &c., as well as electricity.

HENRY MORTON.

Improved Automatic Electric Fire-Alarm.

The improved system of automatic mercurial or electric fire-alarms now being introduced by the Western Electric Manufacturing Company, of New York, may be briefly described as follows:

In the building or part of building whence the alarm is to be sounded is a thermostat consisting of a small glass bulb surrounded with a copper shield, and resembling a thermometer, with a stem about 1½ inches in length, in which a column of mercury rises and falls with the increase or decrease of the surrounding temperature. In contact with the mercury at all times is a platinum wire, and a second platinum wire is inserted in the stem in such a manner that when the column of mercury shall rise to a certain point by reason of increased temperature, it will come in contact with the second wire and complete the electric current. This establishment of a current through the thermostat sounds one or more alarm gongs as may be necessary, and when set in motion by the action of heat, the current is said to be capable of ringing bells of any size, from the smallest electric bell to the operation of an electric-bell striker that would ring out the alarm on the largest church bell in the city. While the alarm is thus being sounded, a pointer on the annunciator, placed outside the building, is arranged to indicate the floor upon which the fire is. With a view to still further perfect the system above described, this company has recently introduced its new automatic signal-box.

This invention consists of a brake-wheel operated by clock-work and controlled by an electro-magnet placed in the current. Should a fire start in a building, the rise in temperature causes the mercury in the thermostat to close the current through the signal-box, when the brake-wheel is instantly released and the register in the fire-station repeats the number of the station in the same manner as the city fire-alarm is received in the different fire-engine houses throughout the city. After repeating the signal by an ingenious device the building is then cut out of the current, thus preventing any interference with other buildings fitted up in the same circuit. There is also an attachment which prevents the possibility of sending false alarms, and at the same time signals the headquarters, should the lines be interfered with by accident or otherwise. The apparatus at the patrol station is arranged so that an outside cross is detected at once, and the particular line on which the trouble arises is known instantly by the action of the current.

The great value of this system of fire protection was well illustrated in the recent fire in the establishment of Mandel Brothers, Chicago, about midnight, on the night of November 15th. The fire-insurance patrol received a mercurial alarm from the building named, and, promptly responding to the same, found that the pointer on the annunciator located the fire upon the fifth floor, to which, without confusion, the firemen made their way and prevented a more serious conflagration. Notwithstanding the presence of three watchmen in the building the first intimation they had of the fire was the arrival of the patrol.

Electric Light vs. Gas.

A Dayton correspondent gives the following interesting account of the progress of the electric-light people in that city:

"I see by the council proceedings that the Lafayette Gas Light Company is on the warpath. Two years ago, under electric-light pressure, they were forced to reduce the price of gas to the city, from $37.50 to $30 per post, and to private consumers to $2.50 per M, and this after a declaration that they could not possibly afford to furnish it for less than the first-named figure.

"This much the taxpayers saved by the competition of the Brush Electric Light Company for lighting the streets, and now that the Edison Company has promised to come and light stores and dwellings, the gas folks hope to bind the city for ten years, and anticipate both the Brush and Edison companies by a still further reduction in the price of gas. Would it not be well for the city to make haste slowly in accepting a ten-year proposition? It seems to me the city has done well by the contract with the Brush Company. Previous to the introduction of the electric light, the gas company had 365 lamps at $37.50, amounting to $13,687.50, now they have 265 lamps at $30 each, amounting to $7,950; electric light contract, $2,500—making a total per annum of $10,450. Taking this from $13,687.50, we have a net saving to the city of $3,237.50 per annum, by the introduction of the Ford school light. Add to this the saving of 25 cents per M, which reduction was made under the same pressure to private consumers, and you get some idea what credit the electric-light folks deserve. Please don't crowd them out by an unconsidered and premature contract with the gas company for ten years.

"Cincinnati made a perpetual contract with the gas company, and to-day it can have no other light on her streets, under city contract; and even though she pays $25 per post for gas, the Brush electric light is displacing her gas in mills and manufactories. Gas people are wont to say that the electric light is in its infancy. It has accomplished much as an infant, is dutiful, has been on hand since it was first lit, every night on the schedule but one, and has lit up the darkness 216 hours when there was no gas at all.

"You can have electric light whenever it is dark; you can have gas only by schedule. It is most uncertain in a storm, just when you need it most. The electric light defies the elements Give both an equal chance, and let the one that proposes to give the most light for the money take the pot. If this is difficult of solution, let the electric-light folks take one-half and the gas folks the other for two years, at the same price, and let them then make a bid for the city for a term of years.

FAIR PLAY.

A meeting of the directors of the Middlesex Electric Light Company, was held at Lowell, Mass., on the 30th ult., when a quarterly dividend of two per cent. was voted. The adoption of the light by the city has proved beneficial to the public, petitions for extension are presented at every meeting of the aldermen, and orders from business men are received every day.

Dangers of the Electric Light.

A recent interview with a prominent electrician elicited the following information:

"Speaking of fires, what is there about the danger to firemen from electric light wires?"

"I claim that they cannot get hurt unless a wire is cut and they take hold of each end where the wire is bare. Our men go up among these wires every night, the only precaution being to wear a pair of rubber gloves. You should mention right here that as soon as a wire is cut or breaks that fact is indicated at the works, and the wire is disconnected from the machine by pulling out a switch plug. Then the current ceases."

"Where the insulation is cut, and the wire comes in contact with metal, there may be danger of fire. We always take extra precautions where the wire passes near buildings. We use additional rubber tubes for extra insulation where the wires enter buildings."

"What is the record of fatalities caused by electric light wires?"

"Of all the lighting done by electricity, I know of but three fatal accidents. One was where a stranger went into a station and was ordered out. As the machine attendant turned his back for a minute the man grasped two brushes. He died. Another, the superintendent of the works at Dayton, O., lowered a street lamp while it was burning, and received a shock which killed him. The only other case I have heard of was a man in New York who took hold of two bare wires and completed the circuit with fatal results. However, as I have explained, accidents are always the result of carelessness."

Electrolysis of Bismuth Solutions.

Messrs. N. W. Thomas and E. F. Smith have described in the *Chemical News* some experiments in the electrolysis of bismuth solutions.

The authors employ solutions of the sulphate or citrate of bismuth, the latter either alkaline or acid. In some experiments the solutions to be examined were put in a platinum crucible, which was surrounded by a coil of wire in connection with the negative pole of a battery, the positive electrode being suspended in the solution. On the passage of the current metallic bismuth is deposited on the interior of the crucible, and can be washed, dried, and weighed. In other experiments the platinum crucible is suspended from a wire connected with the negative pole in the solution in a beaker, the positive electrode being likewise in the solution. In this case the bismuth is deposited on the outside of the crucible. The authors find that the method works well and accurately. The time required to deposit the bismuth varies according to the strength of the solution, and is not shortened by application of heat.—*Journal of the Chemical Society for November.*

Earth Currents.

In a recent communication to the Academy of Sciences, M. Blavier states that the direction and strength of earth currents depend on the difference of potential between the two points where the telegraph wire is in contact with the earth, and not upon the length of the circuit. Between Paris and Nancy there are two circuits of very different natures; they have both given the same result, however. M. Blavier has also ascertained that subterranean lines are not more affected by earth currents than aerial lines.

On the 1st inst., the American Electric Light Co. started up its 100-light plant at Worcester, Mass. About 60 lights, 40 of them street lamps, were used. The central station on Franklin Square was visited by thousands of people during the evening, and the installation has given general satisfaction.

Weider Manufacturing Company, Manufacturer of Agricultural Implements, Swiss Feed Cutters, Sulky and Walking Plows, etc.

MONROE, MICH., Nov. 25, 1882.

MESSRS. DELANO & COMPANY.

Gents:

Will you have the kindness to give me information where I can find the fullest explanation of the dynamos now used, with some explanation of the best? Are they all patented, &c.?

Respectfully yours,
J. K. WILDER, Pres.

ANSWER:

[Our correspondent will find in our advertising columns several systems of electric lighting, all of which are up to the times in the manufacture of dynamo machines, any one of which we think would answer his purpose. The managers of each system are thorough business men, and can be relied upon to furnish the best in the market. We would caution the writer of the above letter that there are many systems (so called) abroad that are built upon worthless patents with the sole purpose to sell stock, and those who buy their machines. All the dynamos worth having are patented.—ED. ELEC. REVIEW.]

The Vienna Electric Railway.

The Vienna Metropolitan Electrical Railway, the construction and financing of which is to be undertaken jointly by Messrs. Siemens and Halske, of Berlin, and the Austrian Lander Bank, is estimated to cost £630,000 in round numbers. A preliminary condition for the project is that the Municipal Council of Vienna shall grant the requisite land for the portions of the line which will be above ground, as well as for the subterranean portions, cost free.

A Motor that Doesn't Move.

The Keely-motor lambs say that they will wait only two months longer for either Keely or the motor, and in the mean time, since a hard winter is upon them, they will not relinquish any more wool from their already pretty closely-clipped pelts. This is strange and unbecoming conduct in the lambs; and no doubt the guileless Keely, as he sits by his little motor and mechanically feeds coal to the steam engine that operates it, is filled with melancholy. "If those lambs would only wait for ten short years more," he ruminates, "and supply me with plenty of money, as of yore, the motor, gathering power from only one drop of water, would surely be capable of taking them to San Francisco, or even to Halifax."

Be patient, gentlemen; the motor and its Keely will soon move—for more funds.

Colonel G. L. Beetle, General Agent of the Western Electric Company, left last evening for Chicago, expecting to spend the Holidays with his family in that city. We think we express the sentiments of the Telephone and Telegraph fraternity, when we wish him and his family a Merry Christmas and a Happy New Year.

The Phœnix Electrical Company, of New York, has increased its capital to $1,000,000.

An alloy of 40 parts copper and 60 parts of ferro-manganese, with a suitable quantity of some appropriate flux, produces a metal of such tenacity that it surpasses the best steel armor plates. The melted mixture is cast in blocks and is perfectly malleable. To obtain a white metal that can be rolled out in sheets, the above alloy is melted again and 20 or 25 per cent. of zinc or white metal added, which imparts to it the desired quality.

Telephonic News

The Waterbury Telephone Exchange and its Management.

This division of the Southern New England Company includes all of Northern Connecticut west of New Britain, in Hartford county, north of Derby in New Haven county, and all of Litchfield county. The central office is in Waterbury, one of the finest and most picturesque little cities in the Naugatuck Valley. Its manager, Mr. A. M. Young, is well known in telephone and telegraph circles, and was formerly manager of the A. & P. Telegraph office in Buffalo, New York. During the fight between the Western Union Telegraph Company, and Jay Gould's company, the A. & P., Mr. Young was an important factor in pushing the latter company into the important position it assumed in the "Bison City" before the consolidation took place. After the latter event Mr. Young migrated to Waterbury, his old home, and took charge of the telephone interests there. Under his management the lines were put up, exchanges built, and a thorough organization of the whole service accomplished. The exchange wires cover all the territory within a radius of six miles, and connects Watertown, Naugatuck and adjoining towns with the exchange located at No. 82 Bank street, Waterbury. The forces employed to give excellent service to the 400 subscribers in this exchange, are five day operators, four for local work, and one to take care of the ten inter-town lines running into this exchange. These operators by name, are Misses Nellie Bailey, Mary Morse, Jennie Boden, Emily Phillips, and Annie Meserve. All night service is performed by Mr. E. C. Ford. For this exchange there is an inspector and line man to look up "troubles" and keep the circuits in repair. Active work has been done this fall in opening up the territory in the northwest. New exchanges have been built at Falls Village and other points, inter-town lines established, and connection made with the Bay State Company at the State line near Canaan, in the extreme northwestern corner of the State. The towns having exchanges in Manager Young's division are, Birmingham, Cheshire, Bristol, Winsted, Falls Village, and Litchfield. In this part of Connecticut much valuable work has recently been done to permanently place the telephone upon a better basis than ever before.

Lawrence, Kansas, Telephone Exchange.

Under the efficient management of Mr. Charles M. Davis, this exchange has been made one of the most important under the control of the United Telephone Company. At present there are fifteen to twenty experienced telephone men at work in the city rebuilding. The main trunk lines are all being transferred from the old poles to new forty-five and fifty feet cedar ones at an expense of $3,000. And so it will be with all lines throughout the city. The old ones will be taken down, and new and more substantial ones constructed. Work will not cease until everything is in first-class order.

It has been through the untiring energies of the manager, Mr. Chas. M. Davis, that to-day Lawrence has its excellent telephone system. When he assumed the duties of this exchange in September last, the central office was in a most dilapidated condition and complaints were universal. Following his arrival came the thorough overhauling of the exchange. The old switch boards were fired and new western electrics put in their stead. Next, over fifty old-styled instruments were disposed of, and in their places were put the new "Gilliland," and to-day the reconstruction is under full headway, which, when completed, will compare favorably with any in this State. When Mr. Davis took charge of the telephone interests of this city, sixty-four telephones were in use, and those mostly in bad shape and out of repairs. To-day there are seventy-six in use and fifteen additional ones contracted for.

The territorial network of wires extending to outside points is certainly worthy of notice. Among the most important are Kansas City, Topeka, Leavenworth, Atchison and St. Joseph, as well as many smaller cities.

The central office is open day and night, Sunday included, where the able manager, or his kind and agreeable assistants are always ready to wait on their subscribers or the public in general.

For carrying on a five minutes' conversation with parties in Topeka, Kansas City, Leavenworth, Atchison, St. Joseph, Easton, Wyandotte and Independence, Missouri, the reasonable fee of twenty-five cents will be charged.

Telephone men inform us that where telephone and telegraph wires run side by side for several miles along a highway, although on opposite sides of the road, the ticking of the instruments can be heard over the telephone wires, without direct communication being made between them. The phenomenon is chargeable to induction, and is among the curious developments of the properties of the electric fluid.

The central office at Mechanicville, which is also operated by the Lowell syndicate, will be discontinued to-morrow, and the switching for subscribers will be done at the Ballston office. The effect will be that no charges will be made for messages between Mechanicville and Ballston, and the rates from here to Mechanicville will be the same as now existing between here and Ballston. There are about ten instruments in Mechanicville and when a subscriber in that burgh wishes to converse with a neighbor the message goes to Ballston and returns, but it don't take any longer time than it did before.

The young ladies of the Saratoga central office, in the exchange building, have added many pretty ornaments to the excellent working accommodations provided by Manager Downs, in the shape of a great variety of pictures which find tasteful grouping and exhibition in the wires running from the ceiling to the switch-board. We doubt if there is a more comfortable or sightly "exchange" than this one on the whole route.

The Pioneer Telephone Company, which has had control of the Boston and Lowell extra territorial business, under a contract having two more years to run, has consolidated with the New England Company, on the basis of one share of Pioneer stock for four of New England.

The Rocky Mountain Bell Telephone Company has declared an extra dividend, notice of which came yesterday from Salt Lake City, making $1 a share for December. The company, under conservative management, has accumulated a handsome surplus after paying their regular dividend, and we are pleased to note the success of the enterprise. Hereafter they will pay dividends quarterly instead of monthly. The directors have decided to increase the rate next year.

Sale of Telephone Property.

LOWELL, MASS., Dec. 8.—The Pioneer Telephone Company has sold its franchises and property to the New England Telephone Company at the rate of one share of Pioneer stock for four shares of New England. The Pioneer Company has had control of the Boston and Lowell extra territorial business, and its contract for this had two more years to run. It has been paying over 30 per cent. dividend.

Time by Telephone.

Our correspondent in Boston says that an additional use has been found for the telephone, which will be hereafter a timepiece as well as a means of communication. possessing the advantage over ordinary timepieces of being always correct. General Manager Downs, of the New England Telephone Company, controls the device, invented by a gentleman in Texas, whereby the telephone can be made to render this service, and it is to be put in use on all lines managed or controlled by the Lowell syndicate. On lines where the device is in operation a person desiring to ascertain the exact time has only to take the instrument from the hook, and holding it to his ear he will soon hear a series of distinct beats indicating the exact hour and minute. If the time happens to be 9:34, for instance, there will be nine beats, then a slight interval, then three beats more rapid than the first, then another pause, and then four beats with the same degree of rapidity as the preceding series—the whole indicating very plainly the figures 9.34, on the same system that the numbers of the fire alarm boxes are indicated when an alarm for fire is given. The ringing of the call will break the circuit and stop these pulsations, for when the instruments are being used for talking, the time current is taken from the "ground" and interrupted until the telephone has been replaced. This feature of the telephone service is to be introduced without extra charge to subscribers. To accomplish this work there is some additional outlay, but the expense is incurred by the telephonic management wholly for the benefit of the telephone users, and the automatic apparatus for the work is nearly completed. As soon as the requisite machines can be manufactured this time system is to be extended throughout the entire New England circuits.

PORTLAND, ME., Dec. 7, 1883.

Editor Electrical Review:

DEAR SIR,—We believe, with others, the idea of utilizing wire fences along railroads for telegraph or telephone lines is worth more than a passing thought or a single experiment.

It seems the trial on the Milwaukee and St. Paul road, described in your issue of December 6th, proved successful, and yet the superintendent seems anxious to head off any further attempts by the cold statement that "in winter, when huge snow-banks completely cover the fences, the line would be made useless."

I would like to ask if *dry snow*, such as would generally cover the fence in winter, is not a very good insulator? and, if any spots might thaw enough to be damp, whether the dry snow and ice (which is also an insulator) under the surface would not prove a sufficient barrier against the loss of current?

Again, if several strands of the fence were united to form one conductor, it would make a passage for the current of comparatively low resistance, thus making it possible to use magnets in instruments of lower resistance than usual. These changes, together with low-intensity battery, would reduce the inclination to escape. If too great a loss of current should still exist, work the line on open-circuit plan, thus preventing loss of battery material when not in actual use.

A long line might be worked in shorter sections than usual, using proper repeaters. This, too, would prevent undue escape by making intense batteries unnecessary.

I respectfully throw out these suggestions for those to consider who may have an opportunity to work the matter up.

I. H. FARNHAM.

Our consul at Tuxpan, Mexico, speaking of the improvements in that company, mentions the help derived from truly American enterprise. One New York telephone company has recently opened a telephone exchange, and has more than sixty telephones in use. American boarding-houses and a hotel have been established.

Worship by Telephone.

I have been so deeply interested while in the city of Louisville, in listening to a Christian, invalid lady relate her feelings and the pleasure which she experiences while listening to church services through the telephone, that I feel constrained to furnish some account for the benefit of some of your invalid readers, who may be thereby induced to adopt the same method of "going to church," while lying on a couch of suffering. Though I cannot give you her exact words, or relate it in the gentle manner in which she did, I will endeavor to reproduce the conversation as nearly as possible.

"For nearly twenty years I have lain upon this couch of suffering, cut off from all outdoor exercise, and especially from the privilege of entering God's sanctuary and meeting with His people in public worship. My pastors have always been very kind in lending me sermons to read, which I have greatly enjoyed, and been benefited thereby, but reading a sermon is not like hearing the living preacher; besides they could not transfer to my sick chamber the whole church service, with its hymns of praise, its Scripture reading, and its solemn prayers. When Sabbath morning came, and the family prepared to go to church, my heart yearned for the same privileges, and I longed to tread with them the courts of the Lord's house; but it was not so to be, and I saw them depart, leaving me to my own private devotion and meditation. These were not often delightful seasons, and God made my sick-room a little sanctuary. When the family returned home they would give me a synopsis of the sermon, and tell me all about the service. But it was not like hearing it myself.

"About a year ago the Telephone Company, through their Treasurer, asked me if I would not like to have a telephone from my room to the church, so that I could listen to the sermon myself. My heart nearly jumped out of my mouth at the bare mention of it, and I quickly answered, 'Indeed I would.' Accordingly the necessary wires were stretched and the instrument placed in position. At the church two microphones were arranged, one on either side of the pulpit, so that if the speaker turned his head either way I would not lose any words. In my room a telephone was placed, and the ear-piece was put on the end of a long wire so it would reach my bed and I could hold it easily to my ear, and thus all was ready,

"With what impatience I waited for the next Sabbath morning to dawn, no person can realize, and as the hour for service drew near I 'got ready for church,' by having the blinds of my room closed in, and all things made quiet, with orders not to be disturbed; my Bible and hymn-book were laid on the bed, and with the ear-piece of the telephone in my right hand I was all ready for service.

"First I heard the noise of footsteps as persons entered the church and the rustle of dresses and fans, and the taking of books from the racks. Then suddenly the organ burst forth with a grand voluntary, and the old familiar sound made the tears flow from my eyes. The music seemed as though it came not from the fingers of man, but that I was listening to the harps and dulcimers of Heaven. But when there came wafted to my ears that grand old doxology in which I had so often joined, 'Praise God from whom all blessings flow,' and I heard it again as it rolled forth from the congregation, I wept like a child, while my heart responded, oh so entirely, to the sentiment, for truly I felt that I ought to praise God that he was making this great blessings flow again to me.

"Then followed the invocation and the Lord's Prayer, and I bowed my head reverently as I listened to the solemn words. The reading of the Decalogue followed, and my imagination ran back to that memorable scene at Mount Sinai when the Lord came down on top of the mount, and answered Moses by a voice. I saw no man, but I heard as it were the voice of God speaking 'all these words, saying—' Never did those commandments sound so terrible or so powerful to me before, and I trembled as they came to

me from an unseen source, so filled with grandeur and power.

"When the number of the hymn was announced I found it in my hymn-book, and knowing that my little, weak, cracked voice would not disturb the fine singing, I joined in and sang the hymn through, enjoying it as much, if not more, than any other person who was listening to it. The Scripture lesson followed next, and having found the chapter in my Bible, I followed the reading of God's Word. No one can imagine the awe-inspiring effect which the Word of God has when listened to in this way. Forgetting the intervention of man, it seems as though the connection is made with the great Author of the Book himself, and that His voice is speaking the inspired words directly to me, making me feel as though I am in the very presence of God himself. As the preacher under whose ministrations I now lie (for I cannot say 'sit') is a most impressive reader, giving new beauty and brilliancy to the Scriptures by his emphasis and intonation, I am deriving more benefit from the Scriptures heard in this manner than I ever did before.

"When the prayer followed, I closed my eyes and listened, and followed every petition with a silent Amen; and when the kind pastor remembered those languishing upon beds of sickness, who were unable to come to the house of God, and so tenderly pled for them, I felt as though my great Intercessor was pleading for me at the Throne of Mercy, and that it was His gentle voice coming to me from before the throne. The effect of the public prayers upon me is of a peculiar character It seems to fulfill the prophecy 'Before they call I will answer, and while they are yet speaking I will hear,' and I realize how more rapidly God's answers can come to our prayers, than even the electric spark can fly, for He knoweth our thoughts ere they are formed into words, and at the beginning of our prayers the commandment goes forth.

"Next followed the reading of the notices, and I seemed to feel a new interest in all the benevolent work of the church, as I heard the calls for the various meetings read. The next hymn was sung, in which I again joined, and then I knew the sermon would follow. I was so excited at the thought of once more hearing a sermon preached from a pulpit to a large congregation of living souls, that I could scarcely hold the ear-piece while I listened for the text. But quieting myself as best I could I heard it distinctly, and hastily turned to my Bible, that I might have it before me. Never did human being listen more closely to every word that proceeded from a preacher's lips, than I did at that time; never did thirsty mortal drink in cooling draughts of water, or starving mendicant devour life-giving food more ravenously than I did those precious words. And as the speaker analyzed the Scripture, and explained its meaning, and brought argument after argument to prove its truthfulness, and then, warming up in his discourse, made the most gentle and pleading application of the thought to each soul within the sound of his voice, I felt as though his eye was on me, and that it was all meant for me. I know not how appreciative the rest of his hearers are, but I doubt whether he has one who feels the force and directness of his sermon as much as I do.

"At the close of the sermon a prayer was offered, to which I responded in my heart and audibly; then followed the closing hymn, in which I joined, and then we were dismissed with the apostolic benediction, to which I bowed my head with reverence, for it again seemed like God's own voice speaking directly to me. I heard the organ strike up a loud strain, the movements of footsteps gradually growing less, until at length all was quiet, and I was home again from church, having enjoyed such a service as I never did in the days of youth and health. I had nothing to distract my attention; my thoughts were not on the congregation; fine dressing and new styles had no effect on me.

"Since that day I have gone to church every Sabbath morning and night, unless through some derangement of the wires or some atmospheric disturbance my telephone does not work, and then I am cut off from my enjoyment. But these do not often occur, and I probably go to church as often during the year as the majority of the most regular church-goers, and I thank God from my heart that he has brought this wonderful machine into the world in this my day, and only wish that every shut-in invalid in the land could enjoy the same pleasure and blessing; and if the publication of my delightful experience will be the means of having telephones introduced to other sick rooms throughout the land, and thus bring the helpless ones into direct contact with the living preacher, I shall greatly rejoice.

"There is something inexpressibly weird and almost superhuman in the sensation produced, and there are times when I am almost transported from earth to heaven. Thus, when the sacrament of the Lord's Supper is administered, the pastor steps down from the pulpit to the communion table, and that removes his voice somewhat from the microphones besides the pulpit; consequently, it seems to come from a greater distance, and when I hear the solemn words, 'This is my body broken for you,' I feel that Jesus himself is speaking right to me, and that it is His voice I am listening to. And sometimes when the choir sing a new anthem or set piece, I think I hear the angelic choir singing the new song, which is being sung in heaven. And when the soprano singer sings a certain solo, in which her pure, sweet voice soars trilling away, softer and softer, it seems as though an angelic visitor had been with me, and as she departed she went singing back to heaven."

I could tell you much more that is interesting concerning this excellent Christian invalid, but have already taken up much of your space. If the recital of this interview shall result in extending the beneficial effects of this wonderful invention, I shall feel amply repaid.—*Observer.*

Cable Telegraphy.

According to recent trials of the speed of working on the Jay Gould cables laid across the Atlantic from Penzance to Canso, in Nova Scotia, 1,000 code words were sent from Penzance and received at the Canso station in eighty-one minutes, including all repetitions and corrections. The 1,000 words consisted of 7,288 letters, which is about equivalent to 1,558 words of five letters each, the average number for the English language. The above rate of transmissions is therefore equal to eighteen words of five letters per minute.

The Montreal Telegraph Company has declared its usual quarterly dividend of 2 per cent., payable January 3d; books close December 11th.

Increased Telegraph Facilities.

ST. LOUIS, MO., Dec. 10.—The Postal Telegraph Company has stretched across the bed of the Mississippi a cable which connects it with the East. The company has nearly completed its line between here and Chicago, and will begin operations here by the new year.

The New Cable Company.

A CERTIFICATE OF INCORPORATION FILED IN ALBANY.

The Mackey-Bennett Cable Company was incorporated on the 12th inst. at the Secretary of State's office, under the name of the Commercial Cable Company. The certificate of incorporation gives the general route of the lines and the points to be connected therewith, to be from New York City; by one or more routes, to a point on the sea at or near Cape Ann, and thence through the New England States, Canada and New Brunswick, or through such countries as may be found convenient, to a point at or near Dover Bay, in the Province of Nova Scotia, and also by direct lines from New York to Canada, and thence to Dover Bay, and in both cases there to connect with one or more of the submarine cables of this company; also, from some eligible and convenient point on the Atlantic coast near Cape Ann, by submarine cables, one or more, as may be found necessary, to Ireland, England, France, Belgium and Spain, or to any one or more of said countries, with intermediate stations, if required, at all or any of the islands in the Atlantic Ocean; also, a land line or lines from a point on the coast of France at or near Havre to the city of Paris; also, a line or lines from N. Y. City through the seaboard of Atlantic and Gulf States of the U. S., and from any one or more of said States by submarine cable or cables to all or any of the West Indian or other islands in the Atlantic Ocean, and to the mainland of South America at such places as may be selected for this purpose, with offices, if required, for the transaction of business at all intermediate points and places; also, a line or lines from New York City through the United States to one or more points in the Republic of Mexico, and by another line or lines to one or more places in California and Oregon, or either of them, and also from one or more points on the Pacific coast to Japan, China and Australia, with intermediate stations. The company, under the Acts of Congress, assumes to itself the right to construct, maintain and operate the lines of telegraph through and over any portion of the public domain of the United States.

The company likewise claims the right to use all its lines as telephone lines, and to become the owners or lessees of all or any patents for inventions connected with telegraphy or telephony. The capital stock is $4,000,000, divided in 40,000 shares of $100, with power to increase said capital stock from time to time, and by such amounts as may be necessary to represent the cost of building and constructing the lines. The shareholders are John W. Mackey, Virginia, Nev., 20,000 shares; Isaac Bell, Jr., Newport, R. I., 10,000 shares; Hector De Castro, New York City, 5,000, and David R. Davidson, Brooklyn, 5,000.

The announcement that Mr. P. B. Delany would describe his system of synchronous multiplex telegraphy at the meeting of the New York Electrical Society, Friday evening, December 7th, brought out an unusually large number of the members, among whom were many prominent inventors and electricians.

After the disposition of the routine business, including the change of night for holding the regular meetings from Friday to Wednesday, the principal event of the evening was reached.

There are many persons who regard the acme of multiplex telegraphy as having been reached when the quadruplex was brought to its present state of perfection. But it is safe to assume that all doubts existing in the minds of those who were skeptical as to the capabilities claimed for this system were dispelled by the time the lecture was brought to a close. Mr. Delany treated his subject in so lucid and thorough a manner that all present became as familiar with the working of the new system as they were with simple Morse instruments.

Mr. Delany being introduced by President Small, began his remarks with a reference to the earliest system of synchronous telegraphy, which was invented by La Cour. Some features of the instruments under consideration are identical with La Cour's.

The speaker then entered upon the main subject of his discourse, and was aided in illustrating his explanations by elaborate diagrams of the apparatus at two stations with all the wire connections, and working models, executed by Mr. E. A. Callahan, of stock-printing instrument fame.

A vibrating fork at each station is automatically vibrated by a local battery and magnet. As the fork vibrates, it makes and breaks another local circuit, containing the battery and magnet, which continuously rotate the transmitting apparatus. This is called the motor circuit. The vibrations of the fork make and break the motor circuit, and will alternately magnetize and demagnetize the cores of the motor magnets. The rotary apparatus consists of a toothed wheel, the teeth of which pass in close proximity to the magnet cores, and constitute the armature of the magnet. The alternate magnetization and demagnetization of the cores of the motor magnet cause the armature wheel to revolve rapidly. Attached to this armature is a trailing contact finger, which sweeps around in a circle over a series of insulated contact pieces arranged on the outer edge of a circular disk or table. These contact pieces number sixty, divided in six independent series of ten each. Two contacts of each series are connected in the same circuit; and, as there are six series, each circuit will have twelve contacts for each revolution. The armature accomplishes $2\frac{1}{2}$ revolutions per second. As the traveling fingers at the two stations are in direct connection with the line, and move synchronously, they will pass successively over corresponding contacts. During the moment the trailing finger is on corresponding contact pieces at each station, the circuit is complete, and independent of the other circuits and instruments. There being six series of contacts, and as each instrument at both stations is electrically connected with two of the contacts of each series, it follows that in one revolution of the trailing fingers the instruments at both stations, which are connected to the corresponding contacts, will be placed in independent electrical communication twelve times, or thirty-four times per second. Such a number of contacts gives to each set of operators a practically unbroken circuit. The transfer of the line from one set of instruments to another is so rapid that the operators do not realize that it has been taken away from one instrument, and placed at the disposal of others. Even during the apparently short time necessary to make the letter "E," the line will have been taken away several times and returned before the execution of the dot is completed. But this is accomplished with such rapidity that, to all practical purposes, there is no interruption. The line is really distributed among 6, 12, 36 or 72 operators in synchronism, so that each pair of operators are put in communication in rapid succession, one after the other. The speed with which any number of circuits may be worked, however, varies inversely with the number. By an ingenious method, "correcting" impulses, which are retarding or accelerating in their effect, are sent out automatically from one instrument to the other, when one should run faster or slower than the other, so that perfect synchronism is maintained to the nine hundredth part of a second. Polarized relays are used and the main battery is split, so that, in transmitting, reversals of polarity occur each time the key is opened and closed. It is a matter of indifference whether one or all circuits are worked in one direction or half the number, or in any other proportion, in opposite directions, as the line between the corresponding instruments at the two stations is always as separate and independent as if the line were devoted solely to their use.

"This system," said Mr. Delany, "offers no inducement to pool wire-tappers. On the wire itself there are about 13,000 pulsations per minute of equal duration, which, of course, would be unintelligible on a receiving instrument. There are no dashes — on the line."

The local circuits are set up in the usual way.

In order to eliminate the static disturbances from the line, narrow contacts are placed between the instrument contacts at each station, and connected together and to the ground, so that the line is put to ground before each completion of the circuits.

This system is admirably adapted to rented wire service. Business men need not hire practical telegraphers; they can use a keyboard themselves, and receive on an ordinary "ticker," or stock indicator. The cost of this service would be $500 per annum for a wire between New York and Philadelphia, against $4,600 for similar facilities furnished by the Western Union Company at present.

At the conclusion of Mr. Delany's remarks, he was tendered a hearty vote of thanks by the society, and congratulated by many of the members individually on the success of his lecture. Knots of members congregated here and there and discussed the merits of the new system, and many were the praises spoken in its behalf.

Mr. Callahan was also tendered the thanks of the society for his diagrams and models, on which the complete success of the lecture, in a great measure, depended.

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We extend to manufacturers of electrical apparatus an invitation to send to this office any and all facts concerning their business which will be of interest to the public. We make no charge for publishing news.

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Are the Arc Wires Dangerous to Property?

In the last number of the REVIEW there appeared an article entitled "Fabrications of the Daily Press," in which it was shown that the sensational articles regarding danger to life from the arc wires, which recently appeared in our esteemed contemporary, the *Times*, and were repeated in court, were either gross exaggerations or made up out of whole cloth.

In the most flagrant case, viz., that of the horse said to have been killed by contact with an arc wire, we proved by sworn affidavits that the animal is alive and well, and at no time received an injury by reason of coming in contact with the arc wires.

It may have been noticed that, in the article in question, we refrained from speaking in regard to the "terrible conflagrations" which, according to the *Times*, have been caused by the electric arc wires.

From the fact of this unexplained omission, the casual reader may perhaps have inferred that the charges made by the *Times*, and reiterated by others of the daily papers, were true This, however, is not the case. We were but waiting until we could gather reliable evidence of the falsity of the charges, and having such evidence now in our possession we propose to lay it before the electrical, mechanical, and scientific community. It consists of a statement made by George H. Sheldon, who is now, and who has for the past ten years, been Fire Marshal of the city of New York; an official who can have no interest in the matter at issue, and who, being interrogated, has, by the aid of the books of the fire department, given a statement of all fires which from May, 1881, up to the present time, have been caused by electric-lighting wires. Here it is:

MAY 15, 1881, 9 P. M.—189 and 191 Sixth Avenue. Four-story brick building, occupied by Sheppard Knapp, dealer in carpets; no damage. Fire occurred on outside of building caused by sparks from wires. Weston Electric Light Company's wires are attached to side of building and near roof of adjoining building; are fastened by iron hooks. The fire seems to have started at that point; marks of fire are plainly visible, and the insulation burned from the wires for some distance.

MAY 27, 1881, 8:20 P. M.—102 West Fourteenth Street. Three-story brick basement, occupied by John Schaffer, lager beer saloon; no damage. Sparks from electric wires (Weston Electric Light Company's) supposed to have come in contact with some material not discovered at or near point where wires pass edge of tin roof. No evidence of fire found on insulation. Mr. Roberts, of 213 Centre Street, the superintendent of company, is at a loss to account for it.

OCT. 24, 1881, 5:05 P. M.—842 to 846 Broadway. Owned by Astor estate. Originated on second floor on top of sign. Building occupied and known as "Germania Theatre." Damage trifling. Cause, defect in the wires of the Brush Electric Light Company. This wire was taken across the top of a sign covered with tin, and fastened to it with iron staples. At one point the insulation was abraded and the wire wrapped with rags; the electricity escaped at this point, meeting the solder and tin, and setting fire to woodwork. Other parts of wire seemed in bad condition.

OCT. 25, 1881, 3 P. M.—Three (3) of the box signal circuits, New York Fire Department, were rendered useless and inoperative, in consequence of the crossing of their wires with one of the Brush electric light wires at Broadway and Pearl Street, the effect of which was the charging of Fire Department wires with the powerful current from the dynamo machines of the Brush Electric Light Company, burning out the relay magnets in Central Office, Fire Alarm Telegraph, destroying the magnets in three of the fire alarm boxes, and injury to several of the other boxes of greater or less extent.

OCT. 13, 1882, 5:12 A. M.—41—43 Centre Row (West Washington Market); damage, $10. United States Electric Light Company's wires becoming disconnected; sparks igniting woodwork. This seems to have been caused by the ignorance of a boy in using the electric light.

DEC. 10, 1882, 6:25 A. M.—174 William Street. Originated in area; damage, $50 Electric light wires (Edison Company) probably defect in insulation.

JUNE 10, 1883, 3:20 P. M.—121 Front Street; damage, $20. Defect in insulation electric light wires (Edison Electric Light Company). The wires were enclosed in an iron pipe. In fitting up the place, this pipe, extending from the areaway into the building, about six feet long was bent. This had fractured the insulation, and the current escaping from the wires burned a hole in the pipe and did some other damage.

SEPT. 10, 1883, 9 P. M.—Nos. 165 and 167 Bowery (Miner's Theatre); no damage. (United States Electric Light Company.) Electric light wires igniting wooden collar on footlight.

SEPT. 23, 1883, 1:20 A. M.—No 88 South Street; damage, $5. Edison's electric light wires igniting rubbish under floor. Wires entered building, but not connected; had been there some time; supposed that insulation had become defective.

OCT. 3, 1883, 9:50 P. M.—165 and 167 Bowery (Miner's Theatre); no damage. (United States Electric Light Company.) Electric light wires igniting wooden ring around burner.

This statement, as has been said, was made by Fire Marshal Sheldon, and is therefore official.

But it seems that, would we show up what would seem to be a conspiracy on the part of the *Times* and others to injure the business of the arc-light companies, it were necessary to get an official statement daily from the Fire Marshal. Only last week it was reported that an arc wire in Fulton Street had thrown out sparks a foot long, fused a heavy piece of wrought iron and set a building on fire. An official investigation, recently made by the United States Electric Lighting Company, has revealed what we expected, viz.: that no sparks were thrown out, no iron fused, and absolutely no danger threatened nor damage sustained.

Thus, it will be seen the terrible conflagrations on which the *Times* has dwelt so pathetically, have amounted in two years and seven months in the city of New York to just *eighty-five dollars* damage. The sworn statement of Fire Marshal Sheldon shows that over ninety per cent. of all fires that have been caused by electric lighting wires in New York City since May, 1881, have been caused by the wires of the Edison system.

From this it would appear that the determination of the Edison people to injure their rivals proved stronger than their judgment and good sense. In such haste were they to strike a blow, that they neglected to ascertain which system had really caused the most fires, and was, therefore, the most dangerous to property, before making their charges in court.

This affidavit sustains the position that has been taken by Prof. Morton regarding the relative defects of arc and incandescence light wires.

As a matter of fact, the wires of neither the one system nor the other are liable to cause fires when properly arranged; for surely a loss by fire of $85 in two years and seven months is not likely to deter any one from attaching electric wires to his building.

We think the arc light people should feel indebted to *The Times* and its abettors for making it feasible to prove in this public way the lack of danger which attends the establishment and operation of the arc light system.

The recent trial will, in our opinion, prove a blessing instead of a curse. The public, peculiarly interested in this case and watching it closely, saw, before it was over, every charge made against the arc-light system disproved; every insinuation brought to the light of day, and shown to be as false as were the protestations of innocence made by the instigators of the suits.

An unscrupulous newspaper, with the single desire of calling attention to its own existence, reduced in its standard of decency as it had been in price, made charges against the arc system of lighting that the veriest school-boy could see were groundless, and took a stand regarding the case that was at trial before Judge Ingraham that even a lawyer, paid to make a special plea for the plaintiff, was compelled to virtually acknowledge untenable.

And now, what does the *Times* do, that it finds it has no case; that it has been inveigled by designing persons into an unjustified assault upon reputable business men? Does it make the *amende honorable* and retract what it has said about the arc system of electric lighting? No; it does neither the one nor the other. It simply gives up the fight, and looks about for other sensations.

During the last five years nearly one hundred and fifty persons have died from the effects of inhaling illuminating gas in this vicinity, and hundreds of thousands of dollars' worth of property have been destroyed through its premature ignition. More than this, Prof. Petenkofer tells us that hundreds of people die yearly in the large cities from the effect of living in the neighborhood of defective gas mains.

But the *Times* is silent regarding illuminating gas; and we will say right here that, with all its professions of virtue, we don't believe it has sufficient backbone to attack the gas interest in the same reckless way it attacked the voltaic light.

With the spirit of the wolf who cast off his ally, the fox, as soon as, with his assistance, it had gained its ends, the *Times* last week published an article in the shape of an advertisement, in which the Edison Company's methods and the Edison system of lighting were held up to public ridicule.

Mortified at its own defeat, the *Times* not only parts company with those who assisted and encouraged its course, but absolutely flings reproaches and abuse at them.

The arc-light companies have now virtually established the fact that their system, when properly superintended, is dangerous neither to life nor property, and it will be a difficult task hereafter, with the precedent now established, to make the contrary appear even to the eyes of an unthinking public.

Underground Work.

It will be remembered that in our issue of May 24th of the current year, there was published a list of the members of the "General Committee on Underground Communication," and also of sub-committees of that body on "Electrical and Mechanical Devices," on Law and Franchise, and on "Business Organization."

Of the first of these sub-committees Mr. Wm. C. Berhens, secretary of the Gramme Committee, is secretary. Of the other two committees, Mr. Robert W. Blackwell, secretary and treasurer of the Gramme Association, and likewise treasurer of the General Committee, is secretary. When we add that Col. Rowland R. Hazard, the president of the Gramme Association, is chairman of the Sub-committee on Business Organization, it will be seen that there is a pretty strong Gramme flavor in the organization of the General Committee.

Although we have sought information from several members of the various sub-committees, they are not informed that anything of any importance has resulted from the labors of the committee. Indeed, the majority of those with whom we have conversed are unaware that the committee has performed any labor whatever.

Circular letters were issued, not only in English, but in several other languages, inviting information concerning underground systems, and replies have come pouring in. These have been examined with great care by the secretary, Mr. Berhens, and he has tabulated and arranged them, and drawn up a report for the information and adoption of the Committee on Electrical Devices. This is as it should be, although one may reasonably ask whether it would not have been better to submit the original material to an expert of more electrical learning than Mr. Berhens pretends to possess. We have not been permitted to see this report. But it is an open secret that it recommends the formation in large cities of companies which shall construct underground conduits of moderate

size, of capacity, varying with the locality, of from 300 to 5,000 wires, which shall be constructed all over the city, the wires to be rented or sold to such companies as have occasion to use them. Connections are to be made with every house, so that, whether the electric light, burglar alarm, telephone, district telegraph or any other current be wanted, the only thing necessary will be to unscrew a plate and "hitch on."

While Mr. Berbens has been elaborating this comprehensive plan, Col. Hazard has not been idle. Patents have been examined into, the matter of the necessary legislation has been carefully worked out, and a number of capitalists, friends of the Colonel, have become "interested." Why Col. Hazard should permit the organization of a syndicate of his friends to control this "system" before it has been enquired into or reported upon by the sub-committee on Electrical and Mechanical Devices, does not appear. Why he should make use of his official position to aid in working up a financial scheme has not been explained. Why the office of the Gramme Association should be turned into an agency for the purchase of patents and the drawing up and the negociation of contracts with inventors and others in the interest of a syndicate, of which neither the constituent companies of the Gramme Association nor the members of the General Committee have any knowledge, will no doubt be made clear in due time.

So far as the electrical success of the scheme is concerned, Col. Hazard is quite positive. He admits that it has never been tested practically, but claims that its success has been "demonstrated mathematically," and so confident is he of this that he looks to the immediate organization of a "Conduit Company," which shall equip New York with conduits at an expense of not over one million dollars per square mile, say twenty millions for the city. The syndicate is not to build any conduits. Not they. They are to purchase and hold the patents, and are to license companies for New York and other cities. It is the licensees that are to put out the money, not the syndicate.

As to the success of the scheme as a "stock deal" Col. Hazard is enthusiastic.

It is probably of little importance what others think of the electrical possibilities in the case, now that Col. Hazard has expressed his opinion; but we are bound to record the fact that several electricians of note have pronounced the "system" absurd upon its face, because of the electrical difficulties involved, and that, although we have made diligent inquiries, we have yet to find one man outside the Gramme office whose opinion is of any value who considers it electrically or commercially possible. The packing of a large number of wires carrying all varieties of currents into a small space, no matter how perfect the insulation, has never yet been done with electrical or commercial success, and this formation of a syndicate to own this "system" and all the patents involved might, with much better taste, be deferred until at least a reasonable test of its efficiency had been made. When the Sub-Committee on Electrical and Mechanical Devices reports in its favor, even by a bare majority of the expert members, it will, like the "affidavit of a thunderstorm" in Iolanthe, "receive all the consideration it deserves;" but, in the meantime, we feel in duty bound to sound this note of warning concerning this new addition to the long list of underground "systems" which it has been our unpleasant duty to expose.

One word more. We supposed, in our innocence, that Col. Hazard would be interested, on behalf of the companies constituting the Gramme Association, to assist in putting a stop, if possible, to the avalanche of exaggerated statements and falsehoods with which the columns of the daily press teem just now, concerning life and property from overhead wires. We were in error. He does not consider these false statements, which, unrefuted, are doing incalculable injury to the companies which he represents, worthy of "serious attention." He cannot see that any good can come from discouraging them.

Does he see that he can help this conduit scheme, financially, by giving these falsehoods the encouragement of silence?

Two Ambitious Landsmen.

The applications of electricity are likely to be even more numerous in the future than in the past, and doubtless in the years to come the ratio of failures to successes in the perfection of electrical contrivances, will be even larger than it is now. Every day almost we hear of those who, forsaking fields with which they are familiar, boldly enter into enterprises in departments with which they are little versed, and look for success where others better informed know that nothing is to be expected.

There are those who are now engaged in making experiments in electrically steering or guiding steamers upon the open sea, and in controlling a light in a way which, to their minds, will indicate a steamer's course, and thus enable her to avoid collision.

Before criticising the objects sought by these ambitious landsmen, for such it is safe to characterize them, let us look at their plans.

After the ship's course has been set, the helmsman's duty is simply to watch the compass and to move the wheel whenever the ship in her progress turns to the right or the left of the course laid down. In this system, to enable the compass to steer the ship automatically, an index or pointer is fixed to the card of the compass in such a way that it may be fastened in any position on the card that may be desired—south, southeast, southwest, &c. When the course has been decided upon and the index placed in the right position, the end of the index rests between two metal pins, each of which is part of an electrical circuit. When the movement of a ship out of her course, to the right or left, affects the compass, the card brings the pointer in connection with one of the pins. This closes one circuit, and the current, by the aid of suitable mechanism, controls one cylinder of the steam-steering engine, and this in turn controls the rudder. The ship obeying the rudder changes its course, and this in turn affects the position of the compass-card, and the index is moved away from the pin and the circuit is closed and the engine stopped.

Commenting upon this absurdity, a writer in one of our popular magazines seeks to give its inventor a few valuable points, gratuitously. He suggests that in place of employing the electric current to move the steam-steering apparatus, it should be used to strike a gong. The sound of the bell would be a signal that the ship had left her course and required attention. By making the closing of the right-hand circuit, or left-hand circuit, cause a bell of a different tone to ring, the deviation of the ship to the right or left could be indicated. The circuits could also be extended to the captain's room, so that the ringing of the bells would inform him of the change in the ship's course.

"If," says he, "the steering is made entirely automatic, there is danger that too much reliance might be placed on it by the pilot, and he might become careless or negligent at a critical moment and place the ship in peril. By making the apparatus merely ring a bell, instead of controlling the steering engine, a watch could be set on the pilot at all times, the ringing of a bell should be the limit of this application of electricity to the compass."

And now listen to this. Having offered these chunks of technical advice, the magazine critic, under the impression that inventors will fly to the Patent Office and register his idea in their own names, is determined to thwart their wicked designs. Therefore he delivers himself of this modest declaration—in reference to his suggestion that the electrical apparatus be made to ring a bell instead of automatically operating the rudder—

"If not already patented, this suggestion will be free, and by its announcement here all persons are debarred from taking an American patent on this application of electricity to a ship's compass."

Here's richness and generosity combined! If science had more votaries of like unselfishness, we could no longer be accused of being a sordid world.

We have presented to us the picture of two land-lubbers, each striving to outstrip each other in new and improved methods of navigation.

Next we shall have them pointing out a new way of cock-billing the yards, sending down the to'-gallan' masts, getting a pull on the lee-crotchet-braces, and splicing the main brace without the aid of sugar and hot water.

Before going on to discuss electricity and the compass card, we would like to ask the magazine critic if the bowsprit of a ship may correctly be described as a prolongation of the keelson, and if the smell of grog on the quarter-deck is a sure indication that the captain has gone below to freshen the nip?

To begin with, the card compass is no longer used on steamers, which are now built of iron. In its stead is used a liquid compass, a popular type being that made by Ritchie, of Boston. In this compass the thirty-two points are marked on a disc, which revolves in spirits of wine or alcohol.

Since the advent of steam-steering gear for large vessels, which relieves the wheel from the strain of the rudder, there has been no trouble about handling the rudder of the heaviest ship. As one watch is always on deck, night and day, there is no dearth of men to man the wheel in the pilot-house, and not even the skipper of the economical "lime-juicer," who feeds his men on vegetables to save beef, and lime juice to prevent scurvy following such a diet, would take the risk of having his vessel steered automatically.

Again, an automatic steering apparatus would not keep a ship out of the way of approaching vessels; and, should men be kept in the pilot-house to look out for such emergencies, they might as well take the wheel themselves and be prevented from going to sleep.

The alleged improvement in this apparatus made by the writer in the magazine only serves to make the original invention the more ridiculous. He evidently labors under the impression that the master of a steamer—captain, he calls him—unlike other human beings, doesn't need any sleep; that it is part of his duty, even when his watch is ended, to lay awake and listen to automatic bells from the pilot-house.

Again, there is no pilot aboard a steamer on the high seas, as the would-be inventor seems to imagine.

In his stead, expert helmsmen are at the wheel night and day, and the "tell-tale" compasses, which swing on their gimbals from the ceilings of all the officers' staterooms, are sure to announce the fact that the ship is off her course.

Thus, as may be imagined, the original invention and the alleged improvement are of no earthly use at sea; and the only use that could be made of them on land, so far as we can see, would be to so connect the butler of a fine mansion with the wine cellar that the master of the house could be informed at any moment, by the ringing of a bell, whenever his man was helping himself to his fine whiskey or gin, and register the amount of water he afterwards poured back into the bottle to make up for that which had been extracted.

And now we have another invention of a somewhat similar character, as the ship steerer. By this it is sought to so indicate a ship's course at night, that an approaching vessel may be warned, and, keeping off, avoid a collision.

An electric light is arranged near the bows in such a manner as to throw a beam of light directly ahead. Upon the ship's wheel are placed two electrical contacts, in such a position that, while the ship is steered directly ahead, no connection is made with either contact precisely as the index on the compass-card is used in the first invention described.

When the wheel is moved and the course changed, connection is made by the wheel with one of these points and the current causes a reflector behind the lamp to move and deflect the beam of light to the right or left.

This movement of the beam of light, seen by approaching vessels, is meant to indicate the change in the ship's course and the direction of the change.

After the course has been changed and the vessel fairly started in the new direction, the movement of the wheel opens the circuit and the reflector automatically returns to its first position of straight ahead.

Approaching vessels will, in the estimation of the inventor, see both the intended or changing course of the approaching ship by the movement of the beam of light, and will, he thinks, be at the same time informed if the new course is maintained.

A device, resembling the one already suggested, also rings a bell in the captain's room each time the reflector of the lamp is turned. A shutter or shade is also provided for preventing deceptive reflections in the water whenever an electric light is used with this apparatus.

The movement of the reflector in the lamp, as first designed by the inventor, was performed by hand independently of the wheel, but the electrical arrangement is evidently better.

This last improvement, like the bell arrangement above, was made by the writer in the magazine. He is willing, he says, to freely give it to the public.

It is well that he gives it to the public instead of to the sailor, for the public may find some use for it, while it is certain the sailor never could.

Every sailor knows that when one ship has approached so near to another in the dark, that her lights can be seen, there is usually no time to guess at what her course is, and certain rules have been laid down for instant action, such for instance as:

"When ahead a red light you see,
Port your helm and go a-lee."

No fault has ever been found with the three lights that every steamer is obliged to carry when under way, except that they are not strong enough, and electricity will no doubt sometime be used for these in place of oil as at present.

The use of a light, as suggested by this inventor, and him who would assist him, would prove an intolerable nuisance, and only serve to puzzle and perplex the mariners who should be so unfortunate as to be running towards it.

A system for the distant signaling of courses is badly needed at sea in thick and foggy weather, but that which is likely to be successful will surely not be one founded upon what can be seen, but upon what can be heard.

Thus, Captain Barker's system, which has up to the present found more favor with mariners than any other, consists in a powerful compressed air or steam trumpet which shrieks out the course a ship is pursuing, or rather that point from which she may be expected to appear, in short, sharp and distinct notes which, in a wholesale breeze of wind, should be heard aboard the ship which is to leeward fully a mile, thus enabling her to get out of the way.

It is to be regretted that ingenious men should insist upon taking up problems based upon conditions which they are not familiar with. If the baker should insist upon being a cobbler, and the cobbler insist upon being a baker, we should have neither good bread nor good shoes.

In other words, the cobbler should stick to his last, and the landsman should confine himself to things which pertain to the land.

Tried in the Fire and Not Found Wanting.

It is recorded that an Englishman, very justly proud of the mechanical skill exhibited by his countrymen in the construction of safes, was expatiating thereon when he was interrupted by a Yankee:

"Say," demanded the latter, "what's the most you claim for your safe?"

"What's the most I claim?" returned the Englishman, "Well, I'll tell you. I saw forty cords of wood piled under one of our safe, which had a live rooster in it. When the wood was burned away the safe was opened and the rooster came out crowing. Can you beat that with your American safes?"

"Well, I reckon I can," said the Yankee, "but if I'm wrong you can correct me; listen. I saw a live rooster put into one of our American safes, which was put on to a pile of forty cords of wood. The wood was fired, and when it was all burned up the safe was opened and there was the rooster *frozen* to death."

Seriously, some of the safes made in America to-day are the very perfection of mechanical skill, and present a striking contrast in efficiency with those formerly made, and which, except under the most favorable circumstances, were little protection.

The old style safe gave an impression of great security against the assault of the burglar as well as from heat. In reality it was only a delusion. The metal of which it was made was easily drilled, and only short exposure to intense heat was sufficient to destroy what was combustible within it.

The great fire in New York in 1835 greatly stimulated the manufacture of safes. The space between the outer and inner plates was, in some cases filled with a composition of plaster of Paris and Mica. Asbestos was also used with plaster of Paris. The latter answers a very good purpose used, and other good incombustible non-conductors also em-

ployed for filling are clay, hydraulic cement and a mixture of alum, fire-clay and carbonate of lime or chalk. This latter preparation was employed in the safes of Messrs. Valentine & Butler of this city, and proved so effective that these safes attained a wide celebrity. From the most terrific conflagrations they were taken without exhibiting any appreciable harm, and with contents intact.

Mr. W. H. Butler, their patentee, has made many improvements in these safes since, which renders them almost impervious to heat, at least for the period of time safes are likely to be subjected to it in buildings.

We had occasion recently to look in at 291 Broadway where the Butler safes are exhibited, and were struck with the excellence of their workmanship, a workmanship which denotes that the guess-work construction which obtains in many other types of safes now so loudly proclaimed, has no place here. It is founded upon a correct interpretation of natural laws, and its best recommendation is the written testimony which Mr. Butler has received from those who have examined his safes after they have stood the test of intense heat, of powder and the cold-chisel.

The Western Union Report.

The Western Union Telegraph Directors on the 13th inst. declared the usual quarterly dividend of 1¾%, payable January 5. The transfer books will be closed in New York and London on December 20 and reopened January 16. The statement submitted at the meeting is very favorable, showing a total surplus of $4,065,509 after paying the dividend declared to-day.

The following statement will show the condition of the company at the close of the quarter ended September 30, 1883:

Surplus, July 1, 1883, as per last quarterly report		$3,658,553 83
Net revenues, quarter ended September 30, 1883		1,669,356 52
		$5,327,920 35
From which deducting appropriations for—		
Dividend of 1¾ per cent., payable Oct. 15.	$1,399,784 67	
Int. on bonded debt	106,420 90	
Sinking funds.	20,000 00	
	$1,526,205 57	
Less portion of the sinking fund for the bonds of 1900 (which was set aside previously), returned to the company by the Union Trust Company, trustees, because of the drawn bonds not having been presented for redemption.	$40,000 00	
		$1,486,205 57
Leaves a surplus, October 1, 1883, of		$3,841,714 78
The net revenues of the quarter ending December 31, instant, based upon nearly completed returns for October, partial returns for November, and estimating the business for December, will be about		$1,750,000 00
Add surplus, October 1, as above		3,841,714 78
		$5,591,714 78
From which appropriating for—		
Interest on bonded debt	$106,420 90	
Sinking funds	20,000 00	
		126,420 90
Leaves a balance of		$5,465,293 88
It requires for a dividend of 1¾ per cent. on the capital stock		1,399,784 67
Deducting which, leaves a surplus, after paying dividend, of		$4,065,509 21

Telephone Stock Quotations.

American Bell Telephone Company	186
Central New York Telephone and Telegraph Company	103
Empire State Telephone and Telegraph Company	205
Hudson River Telephone and Telegraph Company	105
New York and New Jersey Telephone Company	85
Mexican Telephone Company	3⅜
New York and Pennsylvania Telephone Company	80
Southern Bell Telephone and Telegraph Company	130
Tropical Telephone Company	2½
Central Union Telephone Company	100
Iowa Union " "	91
Missouri and Kansas Telephone Co.	92
United Telephone Company (Kansas and Missouri)	89
Bell Telephone Company, of Missouri	165
Wisconsin Telephone Company	125
Cumberland Telephone Company	100
Great Southern Telephone Company	100
Michigan Telephone Company	105
Chicago Telephone Company	286
Erie Telephone Company	59
Union Telephone Company	100
Southern New England Telephone Company	178
New England Telephone Company	74

ELECTRICAL PATENTS

INDEX OF INVENTIONS FOR WHICH LETTERS PATENT OF THE UNITED STATES WERE GRANTED IN THE WEEK ENDING DECEMBER 11, 1883.

289,862 Recorder and register for electric lighting systems; Robert J. Sheehy, New York, N. Y.

290,008 Cable grips apparatus; Henry Dods and Frank Hindes, Virginia City, Nev.

290,098 Dynamo-electrical machine; Jos. Olmsted, New York, assignor to the Olmsted Electric Light and Power Company, New York.

290,025 Governor for dynamo-electric machines; Warren P. Freeman, Brooklyn, New York, assignor to Wm. F. Jobbins, Brooklyn, N. Y.

289,918 Electric motor; Franz Kuhmaier, Pressburg, Hungary, assignor of one-half to Alfred Skene, Kenna, Austria.

290,121 Electrical conductor; Wm. Anthony Shaw, Pittsburgh, Pa., assignor of one-half to Lebbens H. Rogers, New York, N. Y.

290,122 Electrical conductor, or cable for lighting, and other systems; William Anthony Shaw, Brooklyn, assignor of one-half to Lebbens H. Rogers, New York, N. Y.

289,896 Electric magnetic brake; Leo Daft, Greenville, New Jersey.

289,795 Galvanic battery; Robert C. Anderson, London, Eng.

290,149 Galvanic Battery; Julius Unger Cannstadt and Samuel Otto Heuchlingen, Germany, said Eisler assignor to said Unger.

290,150 Electric lamp; Julius Unger Cannstadt and Samuel Otto Eisele, Heuchlingen, Germany. Said Eissle assignor to said Unger.

290,152 Combined gas and electric light fixture; Samuel B. H. Vance and Charles Hindes, New York.

290,157 Insulating compound for electric conductors; J. Burrows Hyde, New York, N. Y.

290,158 Insulating compound for electric conductors, and the process of compounding the same; J. Burrows Hyde, New York, N. Y.

289,823 Electric-arc lamp; Warren P. Freeman, Brooklyn, N. Y., assignor to William Jobbins, Brooklyn.

289,895 Electric locomotive engine; Leo Daft, Greenville, N. J.

289,896 Electric magnetic brake, Leo Daft, Greenville, N. J.

289,897 Conductor for electric railways; Leo Daft, Greenville, N. J.

289,966 Mechanism for firing ordnance by elec. tricity; Amedee Bouilly, Saumur, France.

289,981 Telegraph and telephone cable; Jos. C Chambers, Cincinnati, Ohio, assignor of part to Jas. S. Vine, Cincinnati, Ohio, Wm. A. Jackson, Detroit, Mich., and Nelson C. Gridley, Chicago, Ill.

289,890 Telegraph and telephone conductor; Josephus C. Chambers, Cincinnati, Ohio, assignor of part to James S. Vine, Cincinnati, Ohio, William A. Jackson, Detroit, Michigan, and Nelson C. Gridley, Chicago, Illinois.

289,834 Telephone signaling apparatus; F. Benedict Herzog, New York, N. Y.

BUSINESS NOTICES.

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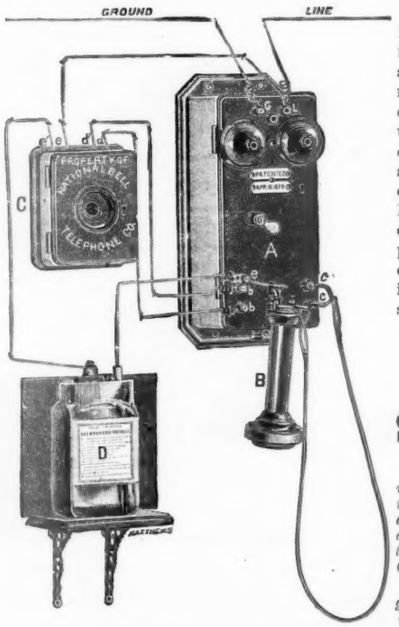

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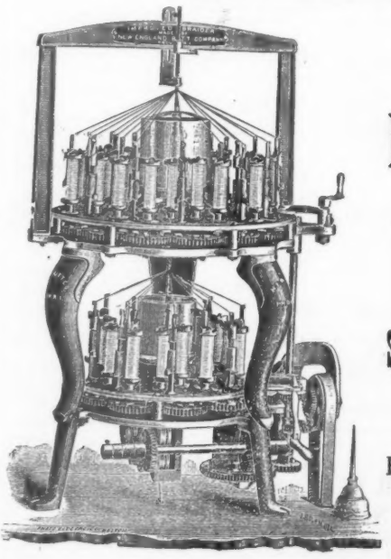

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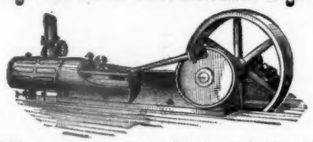

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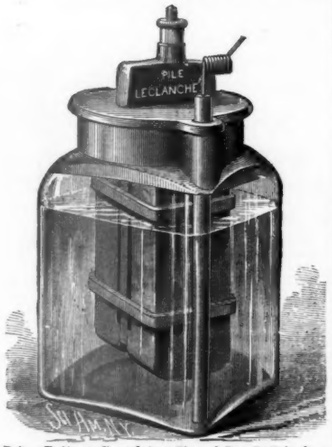

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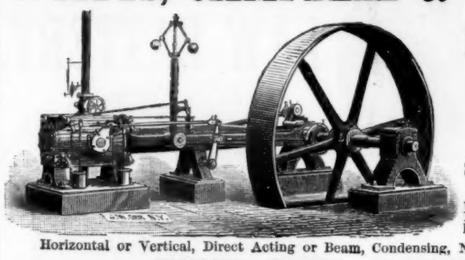

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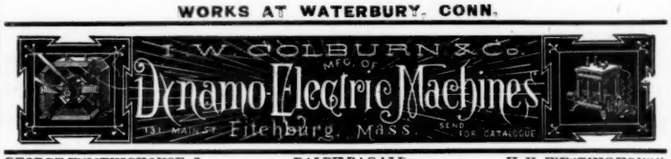

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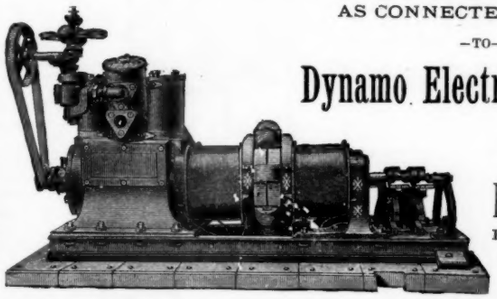

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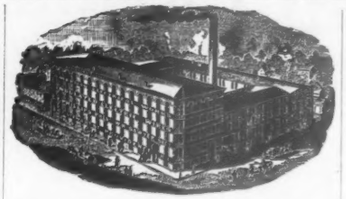

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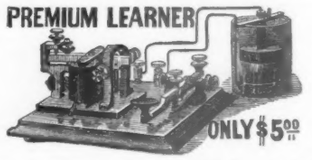

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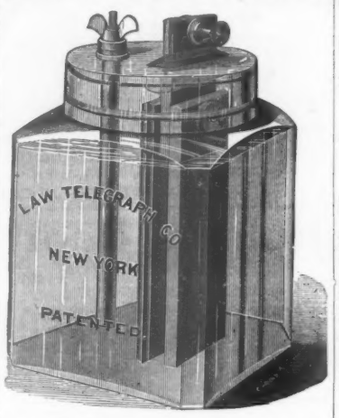

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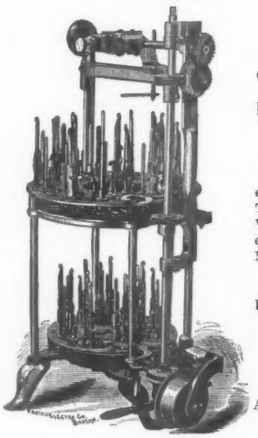

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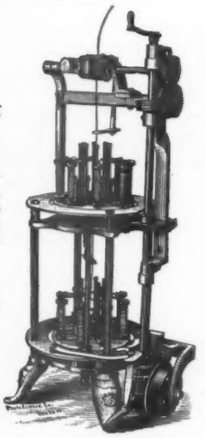

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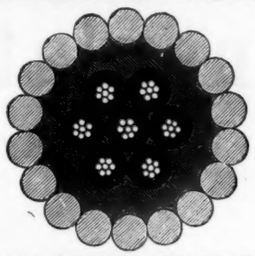

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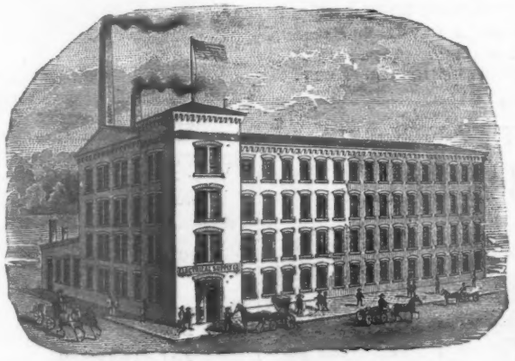

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